Electrical Review

VOL. 79—No. 14. CHICAGO, SATURDAY, OCTOBER 1, 1921. PAGE 497.

Developments in N. E. L. A. Great Lakes Division

M. R. Bump and Officers and Delegates From Four States Tell of Opportunities, Difficulties and Obligations to Be Met in Near Future by Central Station Industry in Serving the Public

Success of the electrical industry in the Great Lakes Division of the National Electric Light Association is assured if the spirit and enthusiasm of the officers and delegates at the first annual convention of the division can be taken as a criterion. From start to finish the convention was marked by a keen interest and determination to place the utility business on a high plane as to service and on a firm foundation as to finances and physical construction. Committee reports were in the main rather short, outlining activities planned for the coming year. However, most of the papers and addresses were right to the point, and were filled with confidence in the industry and the future of the new organization.

W. C. Lounsbury.

Importance of new construction and new financing overshadowed other features of the meeting, making it plain that the leaders of the industry believe the technical problems to be in competent hands and already worked out to a point where the future seems secure. The vast sums required to pay for the construction work now so urgently needed must be gathered, and it is the method of securing these funds that now is occupying the minds of the leaders. Great progress has been made in the past decade, but still greater efforts must be put forth during the next. The central station industry is now 40 yrs. old, but in the next 10 yrs. it will be necessary to invest one and one-half times as much new capital as the present total existing investment, if progress is to be sustained, according to John F. Gilchrist.

That much of the development work on which the immediate future of the industry rests was carried on in the Great Lakes Division was shown in a paper by H. J. Burton, Consumers Power Co., Jackson, Mich. A portion of his comments are reproduced below:

"It is not generally known that Michigan had the first 140,000-volt transmission line in the world, and that the highest preceding voltage of 110,000 volts was also in Michigan. Today Consumers Power Co., Michigan, owns and operates one of the largest and most modern electric transmission and distribution systems in the world. Its territory is the heart of Michigan, the part of the state which produces automobiles, furniture, fruit, paper and world-famous food products, the part of Michigan which has made it the leading industrial state in the Union in proportion to its population.

"Consumers Power Co. is a pioneer in the development of high-voltage transmission, and because of the constructive work done by this company the distance that electricity can be economically transmitted has been increased from 25 to 300 mi. At the present time the company has in successful operation over 1300 mi. of high-voltage transmission lines, 526 of which is at a potential of 140,000 volts. This is, no doubt, the longest line at present operated at this voltage.

"The transmission system of Consumers Power Co. is divided into two parts. The lines on the western side of the state operate at 30 cycles and those on the eastern side at 60 cycles, the two parts of the system being tied together by means of frequency changers at Kalamazoo and Battle Creek. The frequency changer at Battle Creek is rated at 15,000 kv-a. and is one of the largest if not the largest machine of its kind built. The 30- and 60-cycle systems were first tied together at Kalamazoo in 1915, and since then except for short intervals the Consumers Power Co. network of transmission lines has been operated as a unit. Operation of the entire transmission system is under the supervision of a load dispatcher

who is located at Jackson with assistants at Grand Rapids and Saginaw. These men have charge over all transmission line operation, and it is their duty to keep the load distributed among

Milan R. Bump.

the different plants so as to insure the most efficient operation of the system as a whole.

"The steam plant at Battle Creek, known as the Elm street plant, has recently been enlarged and has a steam generating capacity of approximately 35,000 kv-a. This, together with the transformers on the incoming transmission lines and newly installed frequency changer, makes the total combined capacity of the system at this point over 70,000 kv-a. The Elm street plant is also a transmission-line center, being the junction point of the lines from Grand Rapids, Kalamazoo, Lansing and Jackson.

"The Junction dam on the Manistee river which was completed in 1918 is of the highest type of modern hydroelectric development, and it is the largest that can be built in the state of Michigan. The head is the highest of any in the world on a soil foundation and with a spillway. The retaining walls alongside the spillway are, no doubt, the highest in the world with a soil foundation, and possibly with any kind of foundation. The general design is extremely simple and the plant is easy to operate. The efficiency of the turbines is well over 92.5%. The Manistee river is noted for its uniform flow the year around. Last year the Junction plant generated over 52,000,000 kw-hrs. of energy.

"Although Consumers Power Co. was a pioneer in the field of high-voltage transmission its present lines and equipment are modern and up to date in every respect. Approximately 60% of the hydroelectric generating capacity has been installed since 1912, and a large portion of the steam generating equipment is also of recent installation. The transmission lines are largely of steel-tower construction and conform to the most approved standards. The stream flow of the rivers of Michigan is almost constant throughout the year. This is especially true of the Manistee and Au Sable rivers. This eliminates the necessity of storage reservoirs and makes it possible to utilize practically the entire river flow the year around. The water is used over and over again as it flows from one dam to another. In addition to its present hydroelectric generating capacity the company owns 60,000 acres of land with 28 undeveloped dam sites.

"One of the most pressing needs of the times is the development of water power and the conservation of fuel. Consumers Power Co. is doing its part to conserve the natural resources of the country by utilization, and has thus far completed one-third of its hydroelectric developments. When the properties owned by the company are fully developed Consumers Power Co. will be saving to posterity over 1,000,000 tons of coal each year."

These brief comments show that only a third of the water power owned by this company, which has been a pioneer in development, has been used at the present time. More money is needed, and is needed in great quantities.

F. H. Scheel, Chicago, gave a convincing talk on "Consumer Ownership of Utilities," showing how such ownership works to the best interest of the public by assuring good service, satisfactory rates and regulation, and allowing the public to participate in the profits of the business which it supplies. Mr. Scheel stated that securities can be marketed to the public by merchandising or mail order methods much better than by the banking methods used in the larger transactions. The customer ownership proposition needs the moral and financial support of the entire industry. It is only by enlisting such support that the fullest measure of success can be attained, and it seems that the central station

Morse DeliPlain.

industry will be able to make good use of all the money that can be raised in this manner. Mr. Scheel predicted that within the next year the total new capital secured under the customer ownership plan will have reached a total of $200,-

000,000. National advertising and national methods must be employed, and the interest of bankers, manufacturers, jobbers, dealers and workmen in the electrical industry must be enlisted if the situation is met in a manner worthy of the bigness and traditions of the business.

Every man in the industry can provide for his future if he will, without looking outside of his own field of activity. Mr. Scheel pointed out that a sum of $25 per mo. invested between the ages of 25 and 60 yrs. will result in a fortune of $40,000, and that customer ownership opens up an avenue of investment suitable to this kind of saving. It is necessary to carry these facts to the employes of every company in the country and let them carry the facts on in their own fashion to their neighbors and friends. With investment of this character made popular the cost of financing is greatly reduced so that more of the actual money collected from the stock purchaser gets into the construction work than where funds are raised by other methods.

Stability given to a company because of a large list of local security holders reduces the burdens of financing on a larger scale, because of the evident confidence of the customers in the integrity of the management. From this angle it was shown that in some cases more stockholders might represent fully as great an asset as more actual shares sold. Dime banks, thrift stamps and other methods of small financing were described. It was shown that if 3% of the population of Chicago should invest only $0.20 per day the total annual sum would amount to $7,000,000.

John F. Gilchrist, in discussing this paper, told a story about an old couple who lived in Vermont. The woman bought foreign bonds and mining stock, while the man bought stock in the local lighting company. When their banker brought up the question as to why the two chose different investments the man said "Well I don't know much about mines or foreign countries, but I can see the sun go down here in Vermont every night." This simple story is complete. It shows that opportunity lies at home and in the electrical business. Mr. Gilchrist said, "Sell your organization and it will sell the public."

Fred A. Bryan told of his success in selling preferred stock to customers and other small investors. He laid stress upon the importance of marketing in this manner only such obligations as are absolutely sure of paying a steady return to the investor. Moderate returns and safety are the vital considerations, according to his opinion. He told of the selling of $750,000 worth of securities by the employes of his company in a period of 3 mo. One man sold $150,000 worth of stock and lifted the mortgage on his home with the commissions earned by these sales.

Milan R. Bump, national president of the N. E. L. A., was introduced at this time and said that customer ownership was the biggest thing in the industry at the present time. The manufacturer, jobber and contractor-dealer are interested in it and should give it their support in their individual fields of activity. By helping the central station industry they will help themselves.

George E. Lewis and R. F. Schuchardt spoke of the great amount of work ahead of the technical committee. Steps were taken toward the close of the convention to perfect and complete the organization of this committee. The various chairmen of the subcommittees met and outlined in the rough the procedure to be followed during the coming year. J. C. Langdell told of the intensified work to be carried on in meter work in the Great Lakes division, stating that he hoped to have short courses for meter men established at the universities of all four states in the division before the end of the year. There are such courses now established in Illinois and Wisconsin. Mr. Schuchardt, because of his long association with national committee work, was able to give much assistance to the new chairmen. A. P. Thoms showed much interest in his new underground system committee and took steps to get the best possible representation available in the division. D. A. Pierce, appointed near the end of the convention as chairman of the inductive interference committee, pledged himself to handle the work of this important committee to the best of his ability.

Contract routine was covered by R. T. Duncan, and T. W. Berger and G. A. Neal presented an admirable report on the relation between household lighting and appliance load. B. J. Mullaney told about the future plans of the Illinois Committee on Public Utility Information. The program also included talks on "Public Service" by G. P. Barnard, Indiana Public Service Commission; "Training for Public Service" by F. R. Jenkins; "Inductive Interference" by W. J. Canada, and talks by M. H. Aylesworth and Milan R. Bump. Mr. Aylesworth and Mr. Bump, together with Morse DellPlain, president of the Indiana Electric Light Association, gave rousing talks after the banquet at the close of the convention. It is hard to believe that any delegate could have attended the convention and listened to the talks at its close without becoming enthused over the past and the future of the electrical industry in the Great Lakes Division of the N. E. L. A. President Bump is to be congratulated for having a division like Great Lakes in his organization, President Lounsbury is to be congratulated for having so effectively organized his division in such a short period, and President DellPlain is to be congratulated for having had the honor of entertaining the division within his state at its first convention.

CREATING PUBLIC GOOD WILL FOR THE UTILITY COMPANY.

Solution for Various Problems Confronting Central Stations Pointed Out in Address Before Indiana Electric Light Association.

By Morse DellPlain,
Vice-President, Northern Indiana Gas & Electric Co., Hammond, Ind.

Before the war we Americans were without a national vision. We approached every problem from purely a local standpoint. There was in business circles a sad lack of cohesion. But if one can possibly claim any benefits at all from the late war, one can claim that it endowed us with national vision. In our strenuous efforts to

win the war we thought as a nation, found it profitable both for the nation and the individual, so that today we approach our problems from a national standpoint.

One of our nation's greatest problems is the future of its utilities. E. N. Hurley, former chairman of the Federal Trade Commission, in opening a recent address, said, "I have taken the electrical industry as my topic because I believe that there is no question, save the daily problem of feeding, clothing and shelter, which is so vital to the welfare of the American people." From this he proceeded to show that happier, brighter homes and the spread of education were bound to proceed in ratio with the extension of transportation facilities and the development of the electrical industry.

The nation's strength lies entirely in the home. From the home he lives in, from the conditions under which he exists, a man's chief mental inspirations originate. Since 1776 the American home has proved a far greater bulwark in the defense of American ideals than all the battleships, cannon and high explosive shells that we have ever manufactured. Mr. Hurley undoubtedly had this home viewpoint in mind when he referred to the question of our future domestic conditions as being so exceedingly vital to the welfare of the American people. Today—this day of health preserving and labor-saving electrical appliances—electric service in the home means more in real national progress than any other single agency.

Therefore, we, as representatives of the electrical industry in this state, carry a big and very serious responsibility. Our failure or success is reflected in every home in the community where we operate. Electricity, once a luxury, has become a necessity and every day our responsibilities to our national progress increase. I am thinking more than of dollars and cents; I am thinking of the fact that we are morally, as well as financially, interested in this business, and when we all accept this fact it will count greatly in our receiving the square deal which we must have if we are to continue to provide the service that is being demanded at the present time.

It is like stating an axiom to say it is very essential that every utility have the public's good will. Our communities must be taken into our confidence, we must tell it our troubles, invite its co-operation and we will find the wheels are running smoother not only outside the company, but inside as well. While it is not my hope to present anything original or new on this subject, I believe it is one we cannot hear too much about and a little repetition on these fundamentals will not harm any of us.

The most important step toward the successful building up of good will in any community, I believe, is the education of our employes to truly represent the company for which they work. The public, considered collectively, is fundamentally just and fair. It, however, forms its opinions of a corporation just as it forms its opinion of a single person, namely, by noticing the individual man or woman who represents the company, and by remembering what he says and what he does. The one individual with whom the public deals represents in the mind of the consumer the company's policy. Should this individual prove to be courteous, just and fair, the public likes the company, but if discourteous, disobliging, inattentive and disinterested, it will dislike the company no matter how much good-will advertising or publicity is being done, and no matter how good the intentions of the management.

Some Dominating Points in the Public Relationship Problem.

I am confident that intelligent and persistent efforts to render courteous and friendly co-operation through our employes is the true key to the solution of our public relationship problem and the most effective way of accomplishing this is in the education of our employes in the fundamentals of true public service. The public's good will is one of the dominating facts of our new status. Never in our history did we need it so much as we do now.

The second dominating point is the change made necessary in our sales policy. In the war days the usual position was that the load demand exceeded the company's capacity. A utility problem was not so much one of increasing the load as keeping up with the growth of the community and industry within its franchise.

The present industrial depression has changed all of this. Most of our utilities are barely working at half their capacity. We can do either of two things; be content to let things stay as they are and trust to luck that they are to be no worse, or find some means of adding to our load. No live business man would ever contemplate the first alternative. The question, then, is how to increase the load profitably. I say let's get into the merchandising game and play it hard. Let us co-operate with our local electrical interests and between us get our community thinking in terms of electrical household appliances.

Probably our greatest problem today lies with the utilities' future financial policy. Everybody admits that our ship is financially becalmed, our sails are unfurled, and we are awaiting the head wind to drive us towards the new business shore that offers us such wonderful possibilities. We badly need fresh capital, and from where is it to come? In former days public utilities were the favorite investment for the savings of the workingman. It offered, next to government bonds, the greatest security in this country. Its restricted dividends and supervised operations, as represented by the Public Service Commission, have kept the wild-cat speculators out of its activities. People intrusted the utilities with their hard earned money, and the utilities in return regularly paid them dividends.

My message to you as members of the Indiana Electric Light Association may be briefly summarized as follows: (1) Center your thought on the improvement of the domestic life of your community; (2) create good will by every means, and especially do not overlook the value of your own employes as a medium; (3) establish a sound and active sales policy both as to product and merchandise; (4) be reluctant to reduce wages of loyal employes. A loyal employe is a utility's greatest asset in giving good service, and (5) educate your community to the financial necessities of your industry. We must have credit at reasonable rates if we are to keep step with the demands for our service.

Construction and Repair Work on High-Voltage Lines

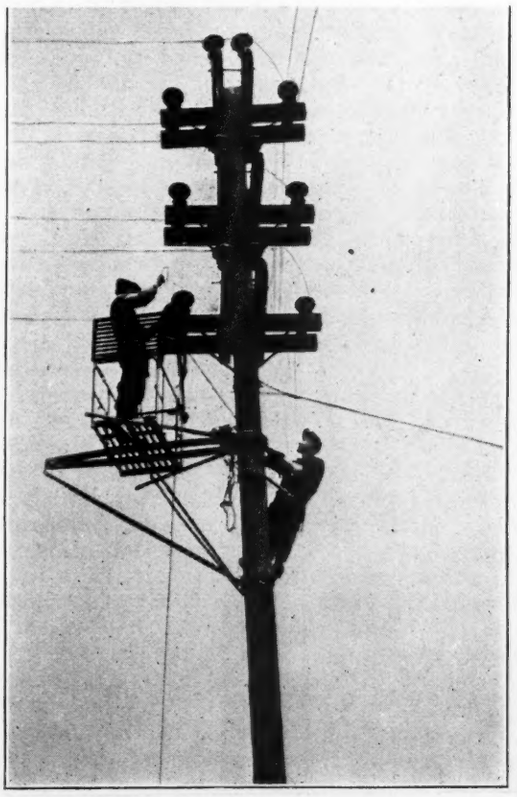
Defective Insulators Located and Replaced While Lines Remain in Service — Features of Demonstration Trip on Which Repair Jobs Were Performed for Several Operating Systems in Two States

By M. D. DOUGLAS and H. B. BUSH

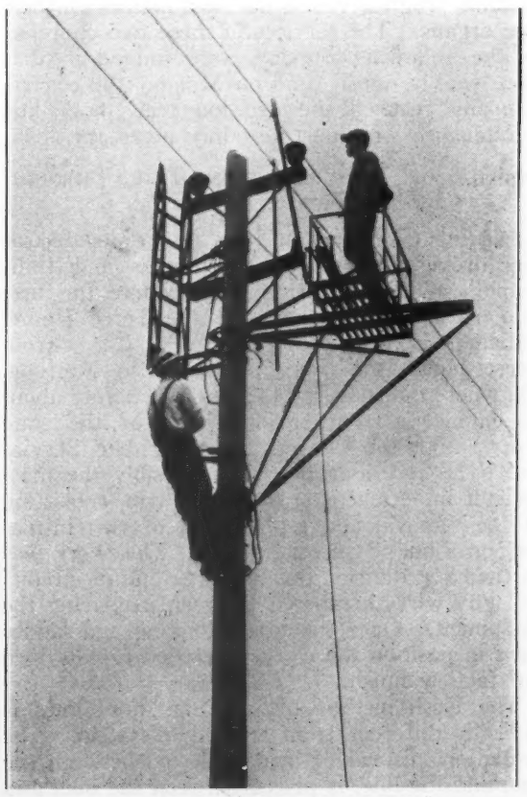
The ease with which high-voltage transmission lines may be repaired and maintained without interruption of service was shown in a practical and interesting way during the present summer by the Bush Electric Co. of Cleveland, manufacturer of "hot wire" working equipment. A light truck equipped with a complete Bush outfit was sent out through Illinois and northern Indiana in charge of experienced men. A total of 2700 mi. was covered in a period of 6 weeks, and during that time demonstrations were given before no fewer than 500 men representing 30 operating companies in the territory covered.

The desirability of maintaining and repairing high-voltage lines "hot" has been generally recognized for some time. During recent years there has been a tremendous growth in the use of electrical power, both commercially and for domestic purposes. In addition to this general expansion of the electrical industry hundreds of manufacturers who formerly produced their own power have found it cheaper to scrap their generating equipment and purchase energy from an outside source, thus throwing an added load on the central station systems. As a result the opportunities for shutting down transmission lines for repairs have become less frequent, and in many cases such opportunities do not arise at any time. Double circuits are expensive, and unless the demand is heavy enough to warrant the high first cost they do not offer a solution to the problem. Looping and sectionalizing afford some relief, but even in the case of looped systems the losses due to sectional shut-downs are frequently large. Interest in "hot" line maintenance has therefore increased a hundred fold in the past 5 yrs. and this interest has stimulated the development of tools for accomplishing the desired results.

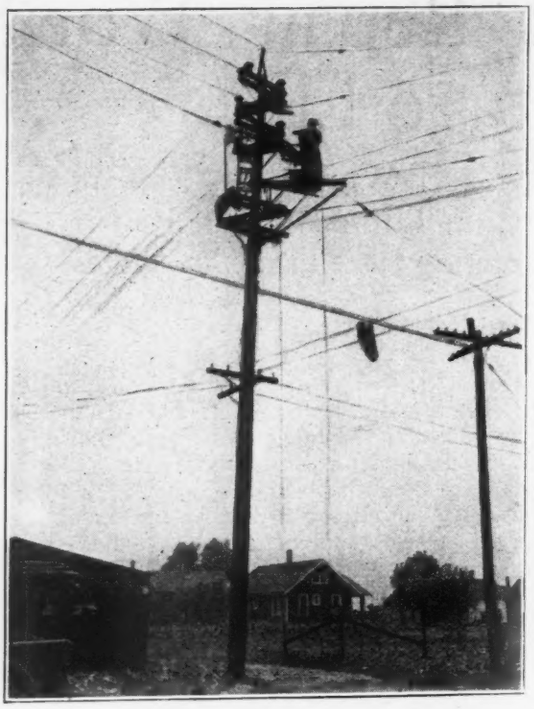
It is interesting to note the various developments which have convinced transmission men of the necessity of maintaining their lines "hot." In one case a hydroelectric power company was supplying several large manufacturers over a single-circuit line in a town 15 mi. distant. Because of a series of unfortunate outrages these



Replacing "Figure Eight" Dead End on 33,000-Volt Line at Terre Haute, Ind.



Insulator Removed From 33,000-Volt Line, Mt. Vernon, Ill.—Southern Illinois Light & Power Co.



Changing Corner-Pole Insulator on 33,000-Volt Line at Mattoon, Ill.—Central Illinois Public Service Co.

customers threatened to "jump" to the municipal plant. A system of patrolling was inaugurated, "hot" line maintenance started, and the day was saved. Another large central station company supplied light and power to a town 20 mi. away. For years line repair work had been done on Sundays. Eventually two of the churches with laudable progressiveness installed motors on their pipe organs. The services in these two churches on the following Sunday were unique in that there was no music, and on Monday the electric company reached the decision that "hot" line maintenance was most certainly necessary.

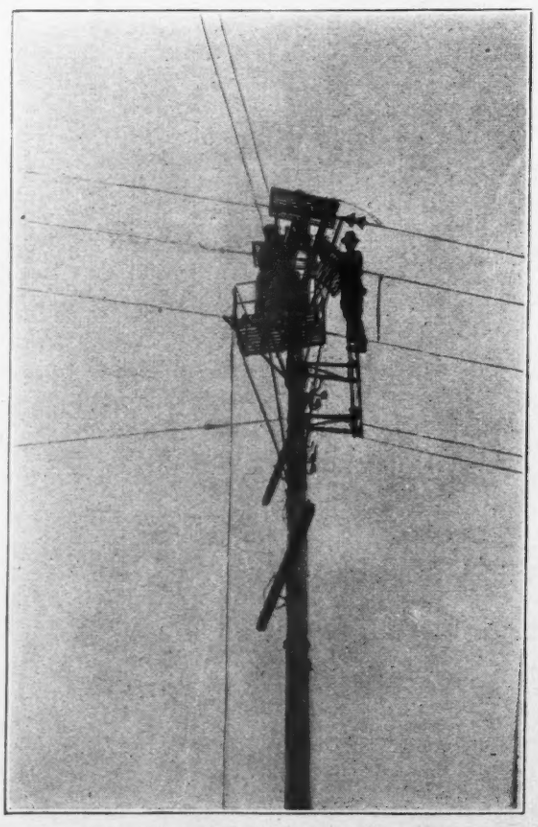
Details of Demonstration Trip Through Two States.

Leaving Cleveland on June 11 the demonstrators drove west through Columbus and Indianapolis to Terre Haute, Ind., where the first demonstration was given for the Terre Haute, Indianapolis & Eastern Traction Co. From Terre Haute the party proceeded to Mattoon, Ill., where a demonstration was held before about 50 engineers from various parts of the state representing the Central Illinois Public Service Co. The job done here was possibly the most difficult undertaken on the entire trip, consisting of the removal and replacement of two insulators on a buck-arm corner pole. This work was particularly difficult because distribution circuits and guy wires hampered the men in placing the equipment. Once the safety staging and ladder were in position the work proceeded rapidly to a satisfactory finish.

The Bush method of working "hot" lines is radically different from any other system. The insulation, instead of being inserted between the men and the line, is placed between the men and the ground (pole). This is accomplished by working from a safety staging or ladder made of treated hard wood capable of withstanding 100,000 volts per linear foot. The staging or ladder (sometimes both if the job is complicated) are secured to the pole by special fastening devices in such a position as to enable the man to conveniently reach his work. Guards, also made of treated wood, are placed to prevent accidental contact with guys, crossarms or a phase other than the one which is being worked. When the man enters the staging he is thus completely insulated and may touch the "hot" line without any sensation other than a slight "zip" as he makes and breaks contact.

In demonstrating this equipment a small transformer was used to illustrate the principle outlined above before proceeding with the regular line work. With the transformer set up in a convenient place on the ground the value of treated wood as an insulator was proven, and a potential of 25,000 volts was handled from the small safety platform.

From Mattoon the route led to St. Louis via Hillsboro, where an insulator was changed for the Southern Illinois Light & Power Co. Two jobs were done in Webster Groves for the Union Electric Light & Power Co., under the direction of A. L. Strother, construction engineer, representatives of the Laclede Gas Light Co. and the East St. Louis Light & Power Co. being present. The first job consisted of the removal of a string of disc insulators on a slight corner, and the substitution of similar units of a different make. This work, done from the staging, would have been practically impossible with any other equipment. The insulators were not only in such a position as to make working from the pole out of



Changing Switch Unit on 13,200-Volt Line at St. Louis, Mo.—Union Electric Light & Power Co.

the question, but the fact that the new string of discs was longer than the old made it necessary to move the Y-clamp out 2 ins. on the line. Following this job a straight-line pin insulator was changed from the ladder.

A second demonstration was given for the Union Electric Light & Power Co. in St. Louis under the direction of J. R. Portnell, superintendent of distribution. A complete Burke switch unit was changed, including the dead-end discs on one side of the arm. The discs were changed first. The defective switch unit was then jumpered, cut out and removed, and the new one placed and connected. For this work both the staging and ladder were used.

Lightning Encountered During Progress of Work.

The manufacturer cautions users of this equipment, or any other for that matter, against attempting to do "hot" line work when there is a thunderstorm approaching. Rain, of course, stops all "hot" work, but there is no danger from the rain itself until it has fallen long enough to wet the surface of the equipment. Lightning, however, is an uncertain factor, and it sometimes appears with very little warning. This happened in Collinsville, Ill., where a demonstration was being given for L. F. Payne, distribution engineer, and other officials of the Southern Illinois Light & Power Co. An insulator had been removed from a 33,000-volt line, and the demonstrator was tying in the new one. The day was extremely hot and, although the sky overhead was clear, heavy clouds were gathering rapidly on the horizon and moving toward the job. It appeared as though there would be slight chance of trouble, however, for the line ran north and south while the storm, approaching from the west, appeared to be quite a distance off. Suddenly the unexpected happened. There was a flash followed closely by a terrific thunderclap right from the blue sky apparently not more than 5 mi. to the north. The demonstrator was finishing the tie and actually had his two hands on the line when the bolt struck. He stepped back in the staging involuntarily although he felt nothing whatever. On touching the line again there appeared to be much less "zip" to it, and when the party returned to Collinsville it was found that the machines on each end of the line had been "kicked out."

After a trip south from St. Louis to Mt. Vernon the demonstrating crew started north via Alton and Jacksonville to Quincy, Ill., and thence back to Beardstown for a second demonstration for the Central Illinois Public Service Co. From Beardstown the route lead to La Harpe where the demonstration included the oiling and repairing of a pole-top switch and changing a disc insulator under the supervision of H. G. Hungate of the Western Illinois Utilities Co.

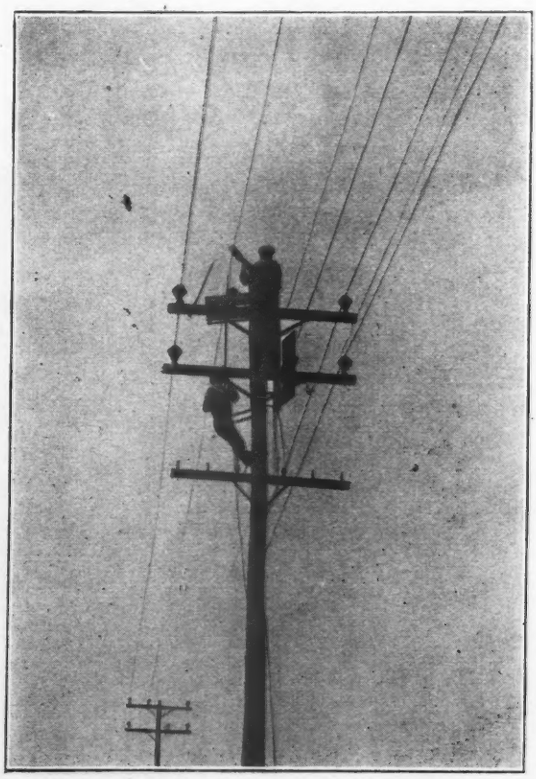
After a trip to Keokuk (Mississippi River Power Co.) calls were made in Monmouth (Monmouth Public Service Co.) and Galesburg (Galesburg Railway & Light Co.) en route to Peoria, Ill. Two demonstrations were given in Peoria for the Illinois Traction System and the Central Illinois Light Co., followed by an insulator change in Canton for the Canton Gas & Electric Co. The truck then proceeded via Lacon (Public Service Co. of Northern Illinois), Dixon (Illinois Northern Utilities Co.), Sterling and Savanna (Peoples Gas & Electric Co.) to Galena where a demonstration had been arranged for the Interstate Light & Power Co.

After demonstrating for the Rockford (Ill.) Electric Co. in Rockford, where pin insulators on a 33,000-volt flat construction were changed, the truck proceeded to Crystal Lake, Waukegan and Chicago. A demonstration was arranged on the lines of the Commonwealth Edison Co. by D. W. Roper, and was attended by a number of representatives of the Commonwealth Edison Co. and the Public Service Co. of Northern Illinois. The safety staging and ladder were used in combination to change an insulator on the upper arm of a double-circuit line, this insulator having been located as defective by means of the Bush phase stick.

Through the courtesy of H. W. Young of the Delta-Star Electric Co. a second demonstration was given in Chicago for representatives of H. M. Byllesby & Co.

Locating Defective Insulators on 33,000-Volt Transmission Line.

The next stop was at Harvey, Ill. The work done here for F. E. Williams of the Public Service Co. of Northern Illinois in addition to a 33,000-volt insulator change included exhaustive tests of the Bush phase set as a means of locating leaky insulators on the line. The phase set, originally designed to replace a potential transformer in "phasing out," consists of a placement stick or light rod with bayonet point and a phase stick provided with a hook in addition to a bayonet so that it may be hung on the line. A special



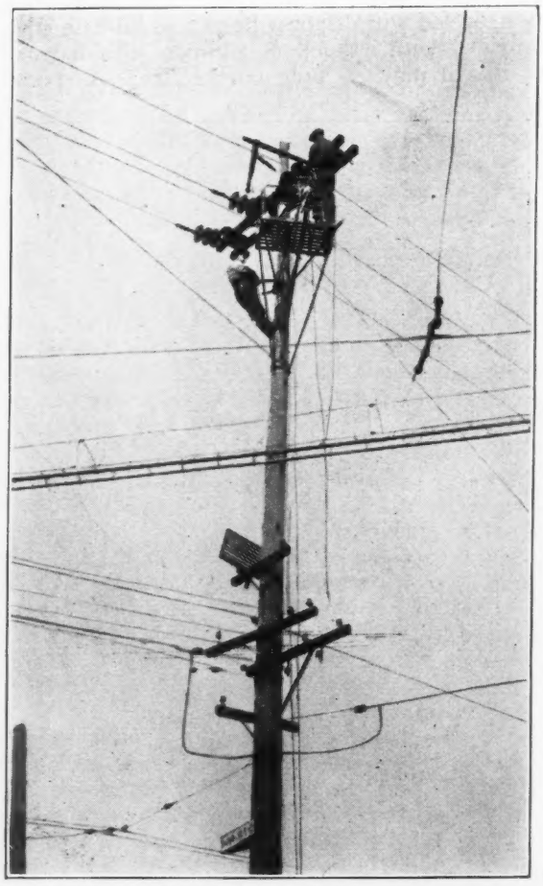
Changing Pin Insulator on 33,000-Volt Line at Harvey, Ill.—Public Service Co. of Northern Illinois.

current-limiting device is built into the phase stick, one terminal being connected to the bayonet and the other to the placement stick by means of a flexible cable. The placement-stick and phase-stick bayonets may be touched to opposite phases without danger of "shorting" the line. The flexible cable is carried on an automatic reel with the result that it is always out of the way of the operator when the phase stick and placement stick are moved apart and brought together. A gap, referred to as the phase gap, is arranged in this circuit on the placement stick. In "phasing out" a spark at the phase gap indicates that the bayonets of the two sticks are touching opposite phases; no spark means that the phases are alike.

When used for pin-insulator testing the phase gap is closed, the phase stick is suspended by means of the hook on a phase other than the one carried by the insulator to be tested, and the placement-stick bayonet is inserted beneath the insulator. If there is a crack in this insulator a spark will pass through it from the bayonet to the line. The extent of the defect can be traced out by moving the bayonet and observing the course of the spark.

Several defective insulators were located with the phase stick during the trials at Harvey, Ill. In one case where some doubt was expressed as to the accuracy of the test the insulator was removed, and it is understood the fault was confirmed later in the laboratory.

The return to Cleveland was made via Gary, Ind., where work was done for the Gary Heat, Light & Water Co. and the Calumet Electric Co., South Bend and Elkhart (Indiana & Michigan Electric Co.). It is impossible to say too much in appreciation of the treatment accorded the demonstrators by the men with whom they came in contact. The spirit of fair play characterized all their dealings, and when criticism was offered it was always of a helpful and constructive nature.



Changing Strain Insulator on 33,000-Volt Line at Peoria, Ill.—Illinois Traction System.

WEALTH OF ELECTRICAL INDUSTRY MORE THAN 14 BILLION.

Wealth is always of interest and a compilation such as that recently made by Prof. David Friday of the national wealth for 1920 is particularly so. It portrays not only the wealth of the nation but indicates as well the chief sources of this wealth.

The total as arrived at by Professor Friday reaches in round figures, close to the fabulous sum of $300,000,000,000, approximately half of which is represented by real property subject to taxation. Next in value, the wealth represented by the railroads and their equipment is placed at $20,000,000,000. Segregating and combining certain of the other items as listed, the electrical industry is credited directly with a wealth of $14,200,000,000, but this figure is very far from being complete.

Many of the other items given include as wealth electrical equipment, as for example, in manufacturing where the value of electrical equipment employed is known to be some $2,045,975,500. That portion of the wealth of other important industries represented by the value of the electrical equipment employed in each is substantially as follows:

Agriculture	$ 90,000,000
Electrified steam railroads	135,000,000
Electric railways	330,000,000
Isolated power plants	250,000,000
Fire alarm and signal systems	80,000,000
Contractor-dealers and merchandise	176,000,000
Electrical publishing	4,000,000
Miscellaneous	20,000,000
	$1,085,000,000

Combining these further totals a partial aggregate of the wealth contributed by the electrical industry is $17,330,975,000. Even this is far from being all, for no account is taken of the wealth represented by electricity in the marine field, the costly electrically propelled and operated naval vessels, or of the wealth entailed in the equipment for the domestic use of electricity.

With approximately 7,000,000 homes wired in the United States, exclusive of Alaska and the islands, each one of which contains from $50 to $100 or much more electrical equipment, it is plain that the electrical industry is directly responsible for a proportion of the national wealth second only to the real property value subject to taxation. Even the value of this property has been materially enhanced by the electrical industry. And a quarter of a century ago there was virtually no electrical industry—at least none which contributed greatly to the national wealth.

If you have any imagination let it play with this query: How big would a town grow on exclusive bus service?—Toledo *Blade*.

Speed Control of Motor Drives by Frequency Generators

Various Parts of Machine With Sectionalized Drive Regulated as to Speed by Manipulation of Rheostat in Field of Generator — Frequency Generators Employed to Adjust Relative Speeds

By W. H. ARTZ

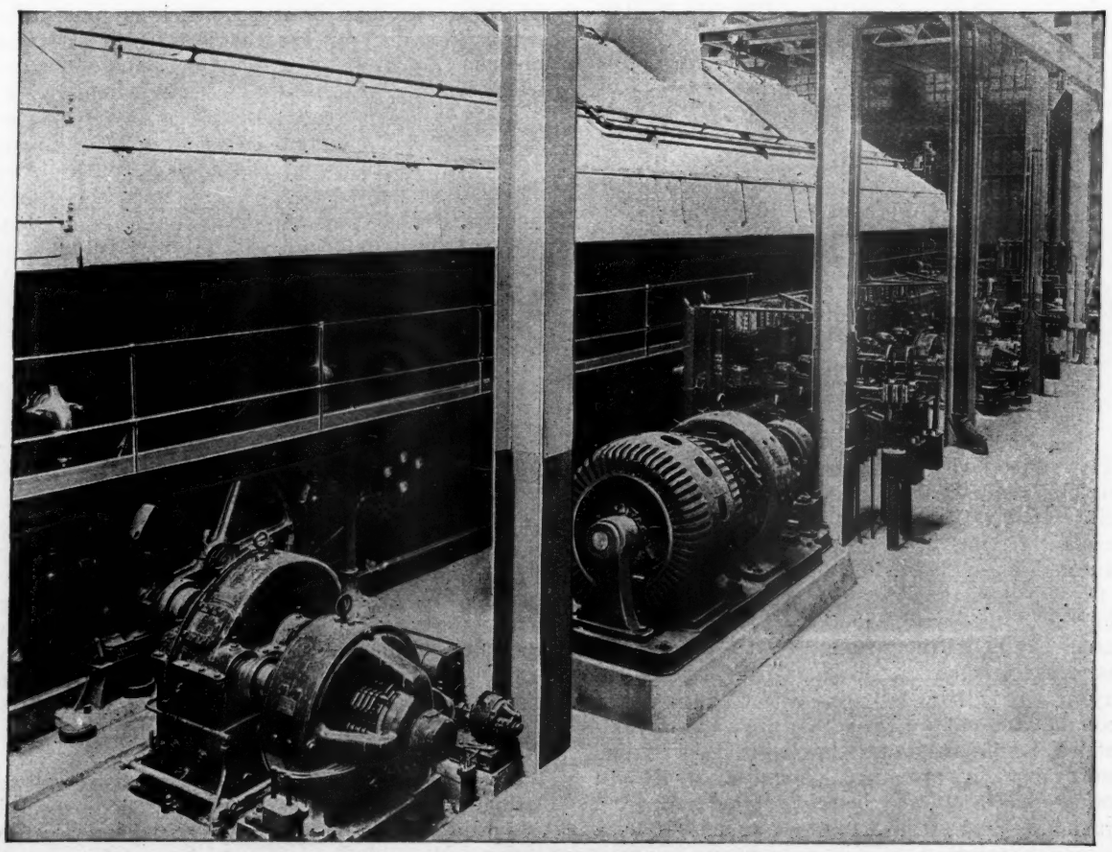
Section Manager, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Recent additions and improvements in the plant of the Abitibi Power & Paper Co., Iroquois Falls, Ontario, which have increased the capacity of this concern approximately over 100%, mark another step in the progress of electric drive and automatic control. A new power plant, located several miles up the river from the paper mill, has a capacity of 25,000 hp. and transmits energy to the mill at 13,200 volts. A modern substation of similar capacity steps the voltage down to 550 for delivery to the a-c. motors throughout the mill.

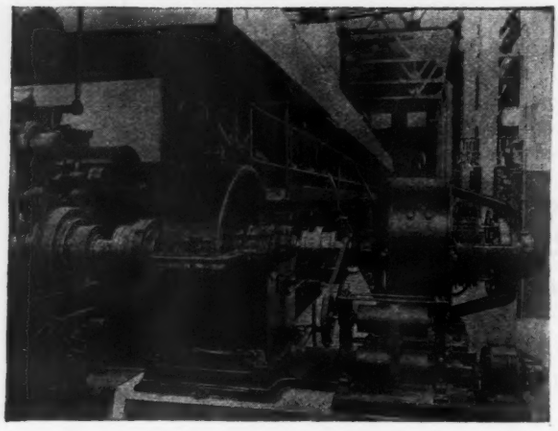
In the paper mill itself the new 158-in. Pusey and Jones Fourdrinier paper machine with Westinghouse sectional individual motor drive and automatically controlled speed regulation is of particular interest. The paper machine consists of a regular couch, three regular presses, two independent dryer sections not geared together and having, respectively, 16 and 14-in. drying rolls in addition to the felt rolls, one 8-roll calender stack and one English-type uniform speed reel, the winders being driven independently from the main part of the paper machine.

The drive and control of this machine, which marks a most important recent improvement in the paper-making industry, solves one of the extremely complex problems of paper making. A paper machine which consists of mechanically independent parts covering several hundred feet of space may require a wide range in speed, depending on the different kinds and grades of paper to be made. Since it is necessary to operate the sections at slightly different speeds extremely close regulation is essential under all operating conditions.

For many years paper manufacturers have realized the disadvantage and limitations of line



View Showing Rear of Switchboard, Motor-Generator Set, and General View of Equipment Driving the Paper Machine.



One of the 75-hp. Adjustable-Speed Driving Motors With Speed Control Device.

shaft and rope drive and have been active in the development of a means for their elimination. This has been successfully accomplished by the recently perfected system of sectional individual motor drive as described herewith. A few installations of multiple motor drive were made 10 or 12 yrs. ago, but with only partial success. This was due to the fact that it was not practical to obtain the same characteristics in the different motors, and in order to obtain the proper speed of the various sections of the paper machine it was necessary to depend upon hand regulation of the motors.

The electrical equipment for this new paper machine is designed for operating at speeds from 400 to 800 ft. per min., and can be adjusted for still higher speeds if desired. Provision is also made for much lower speeds for such purposes as washing up and putting on felts, etc., in addition to the usual provision for inching. The complete system consists of an adjustable-voltage, d-c. generator of sufficient capacity to drive the entire paper machine, with direct-connected exciter; a d-c. adjustable-speed motor for each section of the machine; a Westinghouse reduction gear for connecting the motor to each section driving shaft of the paper machine; a control system which automatically maintains the correct speed of each individual motor, and push-button stations for starting, stopping and adjusting the speed of the paper machine as a whole.

Motor Generator Supplies Power for Driving Entire Machine.

The generator forms part of a standard synchronous-motor-generator set. It is separately excited and is arranged for adjustable-voltage operation, having a rating of 250 volts. A direct-connected 250-volt exciter of sufficient capacity to furnish excitation for the synchronous-motor field, the generator and motor fields, and for the control circuit of the regulator is provided. An illustration of the motor-generator set used in conjunction with this equipment is given in an accompanying cut. The motors are 250-volt separately excited machines, having a two to one speed range by armature voltage control. In another illustration may be seen one of the 75-hp. adjustable-speed driving motors mounted on a common bedplate with a Westinghouse herring-bone reduction gear unit, to which the motor is coupled by a Bartlett Hayward flexible coupling.

An automatic control system for this machine consists of a small master-frequency generator, driven by a small d-c. motor operating in parallel with the section driving motors and separately excited; a small frequency generator driven from each of the section driving motors through a small speed changer consisting of two cone pulleys to one of which the frequency generator is coupled; a powerful synchronous-type rotary relay for each driving motor, which serves to make an electrical contact in one direction or the other on the slightest unbalance of frequencies, and a motor-operated field rheostat under control of the relay in the shunt-field circuit of each driving motor. The master-frequency generator is common to all sections of the paper machine, whereas each section has its own section-frequency generator, relay and motor-operated field rheostat, together with an effective antihunting device. The section-frequency generator and control speed changer may be noted in one of the illustrations on the same bedplate as the driving motor.

The small frequency generators are all excited by alternating current, but since the master and section-frequency generators are excited from the same source any variations in frequency or voltage of the exciting source have no effect upon the regulation, as they do not disturb the balance of frequencies at the rotary relay. Since no appreciable amount of power is required to operate the rotary relay these frequency generators are small in size. The small speed changers referred to are of small size as they do not have to transmit power, but simply overcome bearing friction of the small frequency generators and the friction of their own ball bearings which is practically negligible. By shifting the belt of these speed changers by means of a hand wheel the relative speeds of the sections, or the draw of the paper, as it is called, is accurately and positively determined by the operator, and is thereafter maintained automatically at the correct value. Any unbalancing of the two frequencies at the rotary relay caused by change in speed of the driving motor immediately caused a positive synchronous movement of the relay, making an immediate contact and thereby adjusting the field strength of the motor and returning the speed to the required value.

Governor Functions to Maintain Close Speed Control.

Before any governor or regulator can function there must be a change of some kind in either load or speed, as otherwise there would be no occasion for the regulator to correct anything. However, these changes in speed need not be large enough to be perceptible to the eye or detectable by ordinary indicating apparatus to actuate this new regulator. In fact, the regulator will detect changes in speed of a few thousandths of a per cent and make the necessary correction immediately without any tendency to overtravel or hunt, so that no perceptible change will be found in the draw of any section.

The control board consists of a master control panel for the paper machine as a whole, controlling the generator and master-frequency generator, and a unit section control panel for each of the section driving motors. Starting equipment

is provided on each of these panels, consisting of motor-operated cam accelerating switches with line contactors under the control of suitable push-button stations for starting and stopping the individual motors or the entire paper machine as a whole. The master rheostat under push-button control provides means for adjusting the speed of the paper machine as a unit over the entire range of speed. The rotary-contactor relay and motor-operated field rheostat for each section is also located on the unit section control panel. The push-button stations, mounted on the paper machine frame, provide convenient means for starting, stopping and obtaining any desired speed of the paper machine. The principle of this system of electric drive is exceedingly simple, and no extended period of adjustment of the electrical equipment is necessary. It is worthy of note in this particular that within 2 days after the Abitibi paper machine was started it was placed on regular continuous commercial production, and the complete satisfaction of the mill operators and management indicates beyond question the efficiency and desirability of this drive and control.

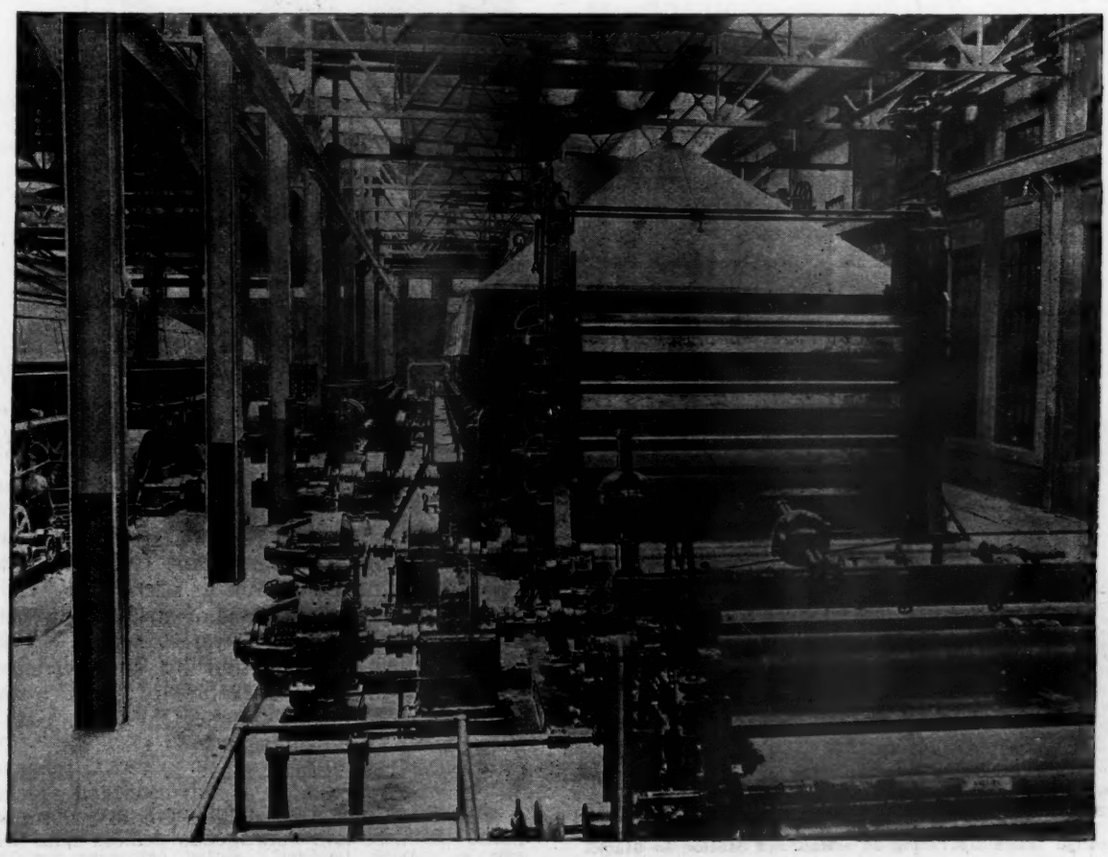
Waterpower and Pulpwood in Vast Quantity Readily Available.

For a paper mill the Abitibi Power & Paper Co. is most advantageously located in the heart of one of the best combined waterpower and pulpwood districts known—Iroquois Falls, Ontario, Canada. Above Iroquois Falls lies the watershed of the Abitibi river, embracing an area of 6000 sq. mi., a large part of which is in the water surfaces of lakes and rivers. Lake Abitibi with an area of 355 sq. mi. forms a storage pond immediately behind the company's power sites and serves as an enormous reservoir for holding the flood waters and maintaining a uniform discharge of the stream.

Immediately tributary to Iroquois Falls is a forest area of over 6000 sq. mi., containing immense supplies of spruce, poplar and other paper making woods and constituting one of the greatest virgin tracts of pulpwood remaining on the continent. Over 1,000,000 acres of these pulpwood lands are now controlled by this company.

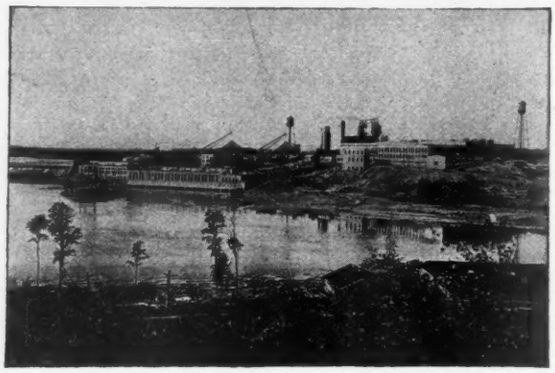
Iroquois Falls is also conveniently situated as regards railroad facilities, it being served principally by the Temiskaming & Northern Ontario railway and its connections. The markets of the United States and Canada can therefore be reached with ease. The company's mills are entirely of fireproof construction and are equipped with the most modern and efficient machinery. The capacity is rated at 160,000 tons of finished paper per year, and a total capacity in salable products including excess groundwood and sulphite of 186,000 tons per year. The company devotes itself exclusively to the production of groundwood, sulphite pulp and newsprint paper, practically all of which is exported to the United States.

From its own timber lands the logs are floated down the Abitibi river to the mill, a distance of 50 to 100 mi. The timber is then conveyed into the mill where it is sawed into lengths of 2 ft. and barked. After this operation a sufficient supply of the wood is conveyed to the groundwood mill where both waterwheel and electric-motor grinders reduce it to groundwood pulp. That quantity intended for sulphite pulp is chipped and



Perspective View of Paper Machine, Showing Master-Frequency Generator Near Third Column From Front.

screened into uniform size and then conveyed to huge digesters which have a capacity of 14 tons per charge. All the timber which is not immediately used for either of the operations described is carried by conveyors to the yard outside the mill. Most of the log driving is done in



General View of Property of Abitibi Power & Paper Co. at Iroquois Falls.

the spring when the ice begins to break and a strong current prevails in the river, so that the immense wood pile in the yard is depended on for supply during the greater part of the year.

With respect to the grinders it is interesting to note that the waterwheels which were formerly used to drive the generators of the old 6000-hp. plant will now be used to drive new pulp grinders which, together with several electric-motor driven grinder units, will add considerably to the capacity of the groundwood mill.

ELECTRIC TRUCKS IN SERVICE IN FOREIGN LANDS.

Realizing the importance of foreign trade most industries will be interested in the following: Japan realizing her basic problem to be that of feeding her population of 60,000,000, has consistently encouraged industry to provide work that each might maintain himself. With the building up of her industries naturally a pace has been set in each which must be kept uniform in each department. The war having raised somewhat the plane of living, the wage has increased. In order that she might compete in some industries it has been realized that equipment to speed production and reduce costs is imperative. In the paper mill just outside Tokyo it was customary to employ a great number of truckers and carriers, each receiving an equivalent of $1.50 per day. These men could handle, at most, two of the bales of sulphide from storage to machines at one time. The Elwell-Parker Electric Co., Cleveland, offered an electric battery truck for this work. It was tried and proved of great service. Today this 90-lb. man shown in the accompanying illustration transports 12 bales, or six times what he once was able to truck, at three times his walking speed, a combined saving of 18 to 1 in time and a total saving in cost of 6 to 1, including every expense in connection with the operation of the unit.

Electric Truck Operating at a Railroad Station in Stockholm, Sweden.

In another illustration is depicted an Elwell-Parker electric truck operating at a railroad station in Stockholm, Sweden. The Elwell-Parker Electric Co. gives the following extract from a letter received from its representative in Sweden relative to this particular shipment of trucks which it seems were shipped in a vessel that arrived in port in a damaged condition with hull half filled with water: "When considered that all six trucks were submerged in salt water

Electric Truck in Operation at Tokyo Paper Mill.

for some 10 days, and after that stood on shore still wet for more than a month, the result is truly splendid, showing excellent material and the very best workmanship. As to the construction in general on all types, the ruggedness and workmanship are all that can be wished for. The performance of the truck has met with very favorable comment from a number of prominent engineers."

ENID HAS PAGEANT OF PROGRESS.

More than 700 people took part in the program of the Pageant of Progress held recently in Enid, Okla., which was reviewed by thousands of people from all over Oklahoma. The steps in the development of Enid from its occupation by the Indians through the periods of struggle and conflict to its present state were staged. Special lighting effects, constructed by 50 electricians and decorators, were a feature of the Pageant. Power was furnished by the Oklahoma Gas & Electric Co., Enid division.

Buyers of electrical appliances are now "at home" to wise and courageous dealers who will call.

Past and Future Development in Power Plants

Limitations of Materials Fix Maximum Temperatures of Steam—Improvements in Stoker and Economizer Construction—Binary Cycle a Possibility—Pulverized Coal Being Used in Large Plant*

By C. F. HIRSHFELD
Chief of Research Department, Detroit Edison Co.

Few people who are not directly interested realize the tremendous extent to which both modern industrial life and modern family life are dependent on electrical energy, or power as it is more commonly called. The revolutionary changes in industrial methods which followed the introduction of the waterwheel and steam engine have been treated extensively in literature, and almost everyone who reads and thinks knows that our entire social structure rests ultimately on these prime movers. The part played by electrical power, however, has not been so widely advertised and is not so well appreciated.

It is practically impossible to obtain accurate and complete figures of the electrical power output of the country, but those given in Fig. 1 are approximately correct, as far as they go, and will serve the present purpose. They represent the growth in central station output over a fairly short period and are indicative of the rate at which electrical power has come into use in the country as a whole. As a matter of fact, these figures do not tell the whole story because much of the power used by street railways is not included and because the total population of the country has been used as a divisor. Since the greatest use of power is in the large and small industrial centers division by the total population of the country gives too small a figure.

To indicate the significance of this feature Fig. 2 is presented. This figure refers to the city of Detroit which has had a most remarkable growth. It is, therefore, not properly representative of all industrial centers, indicating a somewhat extreme case.

Obviously, the production of power by central stations is one of the important items in modern life. The increasing extent of use has reacted upon the industry of power generation in a most remarkable way. In the case of fuel burning stations the development of more economical apparatus, the improved load-factor, and increasing efficiency of operating methods have all been such that there has been an almost continuous decrease in the cost of production per unit of output. It should be understood that this decrease results not only from the more economical use of fuel, but also from better use of capital and labor. It is, of course, common knowledge that the selling price of electrical energy has recently risen in practically all parts of the country. This increase has been due to abnormal prices of all materials, supplies, and labor. These things are probably temporary, and it is expected that their effects will disappear in due time. The details of these facts are well shown by Figs. 3, 4, 5 and 6. The first three figures were developed from data originally presented by G. H. Jones and apply to the company serving the city of Chicago. The last figure of the group applies to Detroit. The lines in Figs. 5 and 6 were plotted on "arithilog paper" to make the slopes directly comparable.

Improved Load-Factor Obviously Reduces Capital Charges.

Three things have had a predominating influence in bringing about the results indicated in these figures. These are: (a) Improved load-factor; (b) increased size and efficiency of steam turbogenerators, and (c) the introduction of efficient mechanical stokers. It is difficult to give average values for the purpose of showing load-factor improvement, because conditions vary greatly from place to place and time to time. However, it will help somewhat to point out that

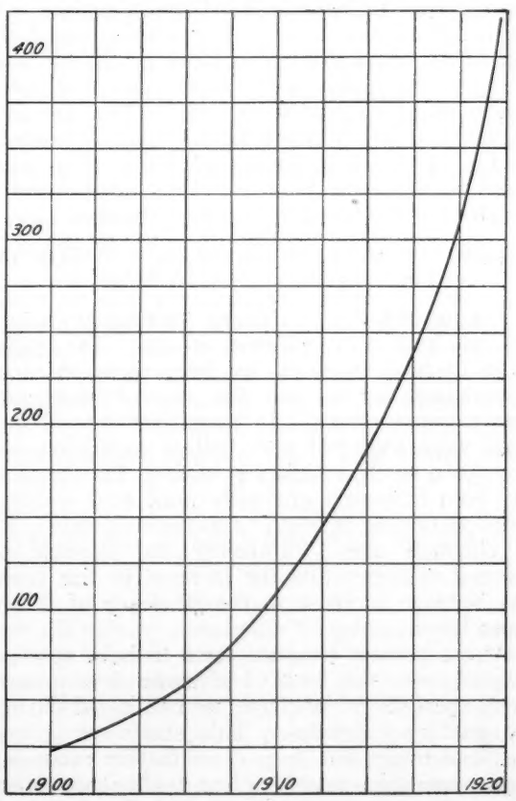


Fig. 1—Increase in Consumption of Electrical Energy in Kw-hrs. per Year per Capita in United States.

*Paper presented before Cleveland Section of the American Society of Mechanical Engineers.

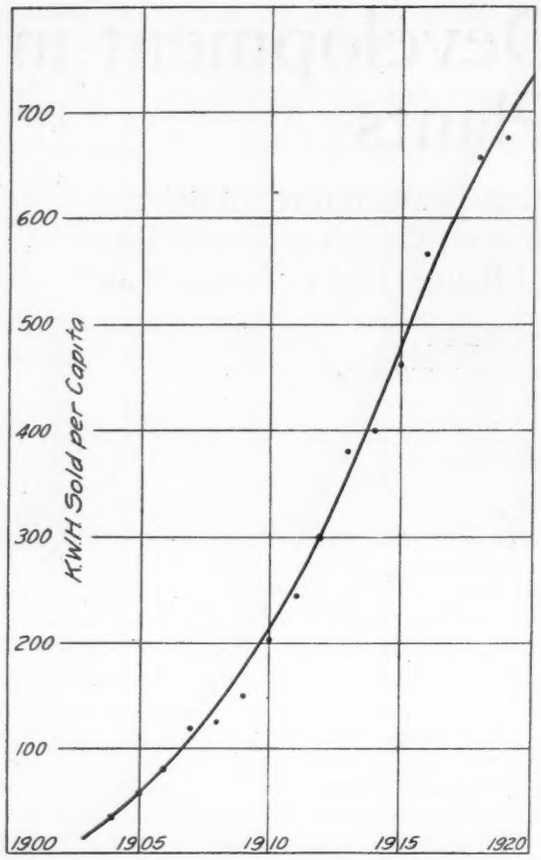


Fig. 2—Curve Showing Total Kw-hrs. Sold per Capita in Detroit.

as a central electric supply changes from a pure lighting to a combined lighting and power supply the load-factor changes from something of the order of 10% or less to a value between 50 and 70%. Obviously, capital charges in the first case are extremely heavy when compared with capital charges in the second case. The size and efficiency of steam turbogenerators are, of course, readily expressed in numerical form. Fig. 7 is given to illustrate the marvelous developments which have occurred within two decades.

Thermal Efficiency Improved and Size of Unit Increased by Stokers.

The introduction of efficient mechanical stokers has had two quite different effects. The boiler room thermal efficiency has been increased to a remarkable degree, and the size of units has grown tremendously. In 1900 most central stations were equipped with boilers containing not over 5000 sq. ft. of heating surface, but this size has been increased gradually until now we find units containing between 12,000 and 24,000 sq. ft. in common use. Paralleling the increase in thermal efficiency and the increase in size there has been an increase in the efficiency of boiler room labor.

At the present time we seem to have reached very close to the limit of ultimate development along the lines which have been followed during the past two decades. This statement is not meant to imply that there is no further room for improvement in central stations as they now exist. Obviously, no central station not built within the past year or two can contain all the latest developments. Almost all central station companies operate one or more old plants which could be improved by reconstruction—in many cases this reconstruction can be economically justified and is being carried on or is contemplated. The real significance of the statement is this: Since about 1900 we have pursued a fairly consistent sort of development along fairly definite lines. During the entire period further possible improvements were always visible, and one could predict with a reasonable degree of certainty that each succeeding year would produce certain definite modifications and advances. Now we seem to have reached a point where marked increase of economy in the use of money, labor or fuel can be made only by radical changes of some kind. Rather curiously we arrived at this point in the evolution of the art at just the time when there was the greatest need of conservation in the use of capital, fuel and labor. The driving force furnished by the excessively high prices for money, fuel and labor which have characterized the last 2 or 3 yrs. would have been sufficient to cause improvements of tremendous magnitude had we known just what direction to take. Unfortunately we found ourselves at a sort of parting of the ways, and the best brains in the industry in this country and in Europe have been trying to map the road to be followed in the immediate future.

Steam Turbogenerator Developed to High State of Efficiency.

Out of the work already done have come several very definite indications, but I cannot feel that any of them promise enough to justify us in concluding that they mark the way. Rather are they to be considered merely as the finishing

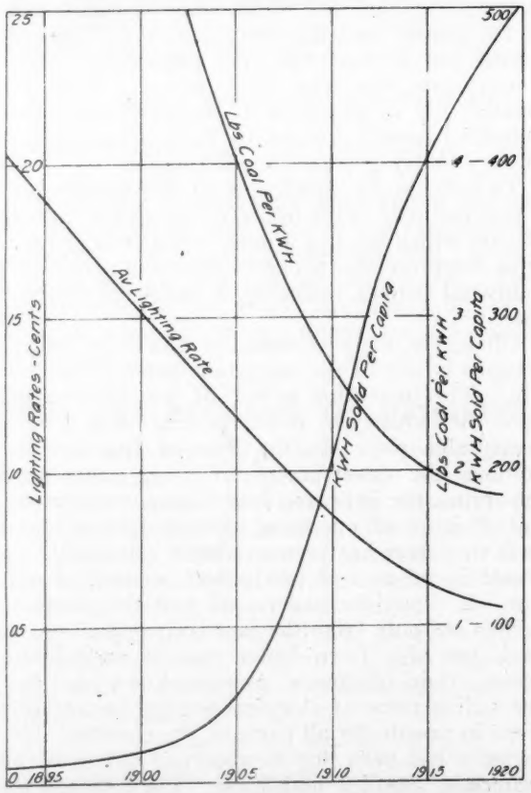


Fig. 3—Variation of Retail Lighting Rate With Coal Used and Energy Sold per Capita in Chicago.

touches to the existing type. I believe that we are just polishing off the steam turbogenerator type and that while we may be forced to continue doing so for quite a few years we are essentially marking time while waiting for a new epoch-making design, invention or development. There is nothing now in sight which promises any change so revolutionary as the introduction of the steam turbine or the stoker, but this must not be interpreted to mean that I do not believe something of this sort is coming. I feel perfectly certain that development will be even more rapid in the future than it has in the past and that as a result the allowance for obsolescence should be made higher in the future rather than lower.

All engineers who are familiar with the theory of steam engines and other heat engines know that theory indicates increasing thermal efficiency as upper and lower temperatures of the working substance are moved farther apart. In the case of the steam turbine this is equivalent to saying that the thermal efficiency will improve as the temperature of the steam reaching the unit is raised and as the back pressure and, therefore, the temperature of steam leaving the unit is decreased. We already have many stations operating with maximum steam temperatures of 600 deg. F. or higher, and we are rapidly approaching a temperature of 700 deg. F. A value between 700 and 800 deg. F. is generally considered to be the highest that should be used with the metals and alloys and the types of construction now in use. It is my personal opinion that 700 deg. F. is about as high as we can safely go at present.

At the other end of the temperature scale we are now operating our best plants with an aver-

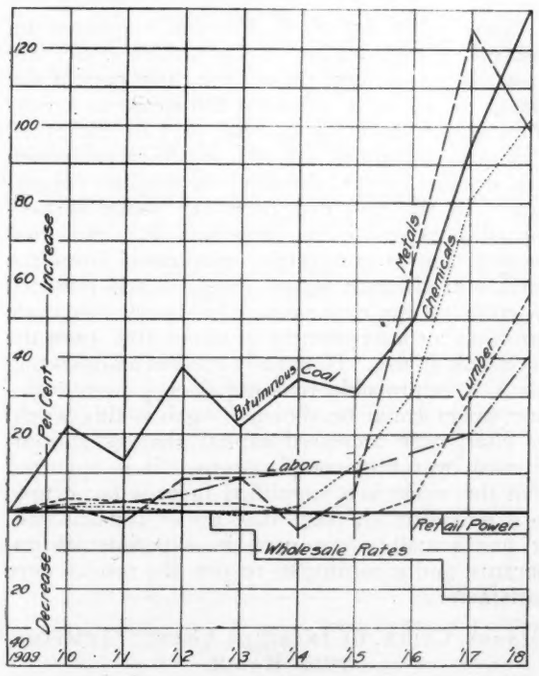


Fig. 4—Increased Cost of Factory Materials Contrasted With Cost of Electrical Energy.

age back pressure throughout the year of about 1 in. of mercury, and there does not seem to be any possibility of greatly improving this performance. With the temperature limits thus

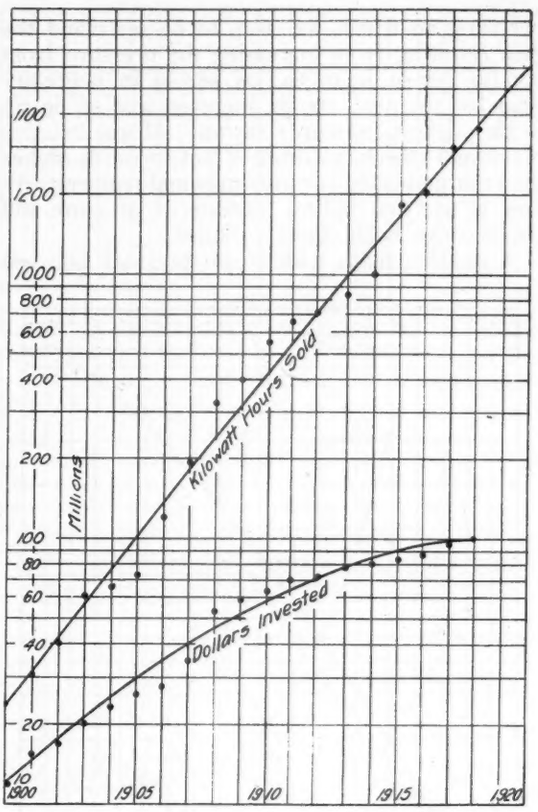


Fig. 5—Increase in Investment Compared With Increase in Energy.

definitely set, and already practically attained, engineers have begun to consider seriously the possibilities of using higher steam pressures without exceeding the upper temperature limit, It is commonly known that the temperature of saturated steam increases with pressure, but the form of the curve connecting pressure and temperature is not generally appreciated. Such a curve is given in Fig. 8. It is obvious that temperature increases very rapidly with respect to pressure at low pressures, but that this relation is reversed at high pressures. At present a few central stations are using or are being constructed to use a pressure of from 300 to 350 lbs. per sq. in. The curve of Fig. 8 shows that saturated steam at such pressures has a temperature well below 450 deg. F. If we assume that it will be possible to utilize pressures as high as, say, 500 lbs. per sq. in. in the near future we will reach a saturation temperature only a little higher than 450 deg. F. To attain steam with a saturation temperature of only 600 deg. F. we should have to utilize a pressure of almost 1600 lbs. per sq. in.

Superheated Steam Required to Attain Upper Temperature Limits.

It is quite obvious that if we are to operate with the highest permissible temperature we must use superheated steam, even if we increase the maximum pressure to the highest imaginable limit. The curves of Fig. 9 are presented to indicate the theoretical possibilities of higher pressures. It will be observed that the theoretical efficiency of the cycle increases with increasing pressure for both saturated and superheated steam. It will also be observed that at the tem-

peratures to which we seem to be restricted the gain resulting from increasing the pressure from 200 lbs. per sq. in. to 300 lbs. per sq. in. is greater than for the next 100-lb. increase, and so on up to the highest pressures shown. Moreover, this maximum efficiency shown is not so much higher than that indicated for pressures and temperatures now in use that radical increase of pressure and temperature holds great promise.

A modern plant with steam pressure between

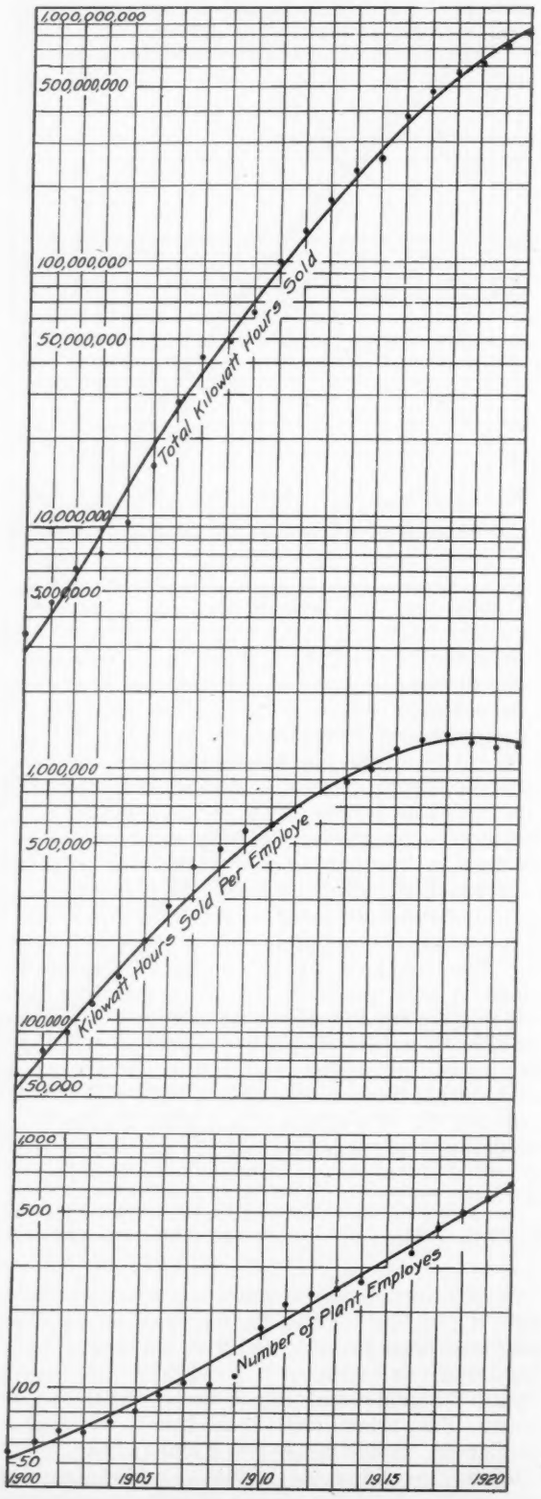


Fig. 6—Increase in Energy Sold Compared With Number of Plant Employes in Detroit.

200 and 225 lbs. per sq. in., and with a steam temperature of about 600 to 650 deg. F., can produce power at a cost of about 19,000 B. t. u. in fuel per net kw-hr. If the same ratio between actual results and theoretical efficiency of cycle holds for higher pressure and temperatures we should be able to produce a kilowatt-hour for about 17,500 B. t. u. with steam at 400 lbs. and 700 deg. F. Taking probable extreme limits, and assuming 600 lbs. and 800 deg. F., the cost of a kilowatt-hour would be about 16,000 B. t. u.

Such figures are certainly worth striving for, but unfortunately they do not tell the whole story. First, the cost of equipment will certainly increase with pressure and, to a certain extent, with temperature. Increased thermal efficiency will, therefore, certainly be partially offset by increased capital charges. Second, the ratio of actual to theoretical turbine efficiency should decrease with increasing pressure, so that the thermal gain to be derived from high pressures must be discounted to a certain extent. Third, the increased boiler pressure means increased flue-gas temperatures, and this must result in offsetting part of the calculated improvement. If this increased loss is prevented by the installation of a device like an economizer or air preheater we have increased capital and operating charges to consider.

It is my personal opinion that it will be quite a while before we resort to pressures higher than 400 lbs. per sq. in., and that fuel will have to cost much more than is probable for the immediate future, while capital must if anything cost less to justify exceeding such a value. Against this is to be set the fact that we are now using or preparing to use 350 lbs. in this country, and that in England they have already exceeded 400 lbs.

Many years ago S. Z. Ferranti suggested an interesting modification of the turbine cycle. He proposed to add heat during the early part of the expansion so as to maintain the steam at a constant temperature during that part of the cycle. Practical difficulties led to a modification which has, to most people, obscured the original suggestion. In the modified form the steam is permitted to expand in the same way as is now customary, but is completely withdrawn from the turbine at different points, reheated, and returned to continue the expansion. In theory this cycle promises an improvement of about 10% over the cycle now in use. If actually used in an operating plant it is probable that not over 5 to 6% improvement could be shown. Against this would be chargeable increased capital charges and increased operating complications. It is rumored that this cycle in a simplified form is to be used in a new English plant now under construction. It has actually been used in experimental apparatus, and according to reports the results were satisfactory.

Binary Cycle to Increase Useful Temperature Range.

Another interesting suggestion emanates from W. L. R. Emmet. Many binary cycles have been proposed, and thermal savings can be calculated for most of them, but the one suggested by Emmet seems to be the most promising. He proposes the use of mercury as one working substance and water as the other. The mercury is

vaporized in a fuel-fired boiler something like a steam boiler, is expanded in a small turbine, and is condensed in a device which may be called a condenser boiler. This device transmits the latent heat of vaporization of the mercury vapor to the water, converting it into steam which is used in a turbine in the ordinary way. Mercury boils at 677 deg. F. under atmospheric pressure and at 457 deg. F. under a pressure of 2 in. of mercury. It thus is ideally fitted to extend the upper temperature limit without introducing prohibitive pressures. It also has such other physical characteristics that a comparatively cheap turbine can be used.

This proposal of Mr. Emmet's is by all odds the most promising of the binary types, and it seems to be the only one that warrants serious consideration at the present time. It promises a return of about 40% more power from a given quantity of fuel without a prohibitive increase in investment.

Turning to the boiler room, the introduction of the efficient and flexible mechanical stoker has reacted in two different ways. It has made it possible to obtain much higher boiler room efficiency—day in and day out, and month after month—and it has made it possible to drive boilers at much higher ratings than were dreamed of a comparatively short time ago. Increasing the quantity of steam which can be produced from a given equipment naturally reduces the overhead charges per unit of steam output.

The power producer does not care whether his power becomes cheaper because of more efficient use of fuel or because of more efficient use of capital. Consequently there is evident an increasing tendency to "over-stoker" boilers and to drive them at high average rates. This is quite proper if it is not carried too far. Unfortunately the thermal efficiency of boiler units decreases with increasing output above a certain point, and if the rate of evaporation is carried far enough a point is reached at which decreased thermal efficiency and increased maintenance more than balance the savings in capital. The point at which this occurs differs with the character of equipment, the price of capital, the price of coal, the

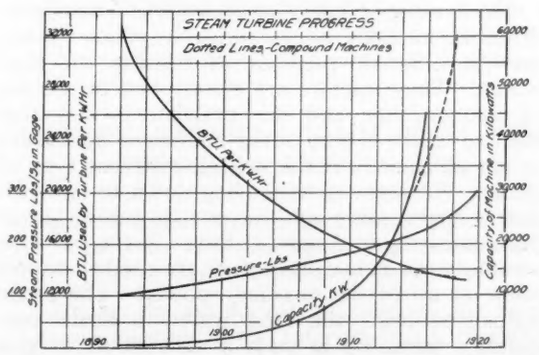


Fig. 7—Curves Showing Progress Made in Steam-Turbine Design.

load-factor and other considerations, but under average central station conditions the most economical point will generally be found well below 200% of normal rating if economizers are not used. The addition of economizers naturally raises the proper value. It is probable that the cost of capital and apparatus will ultimately come

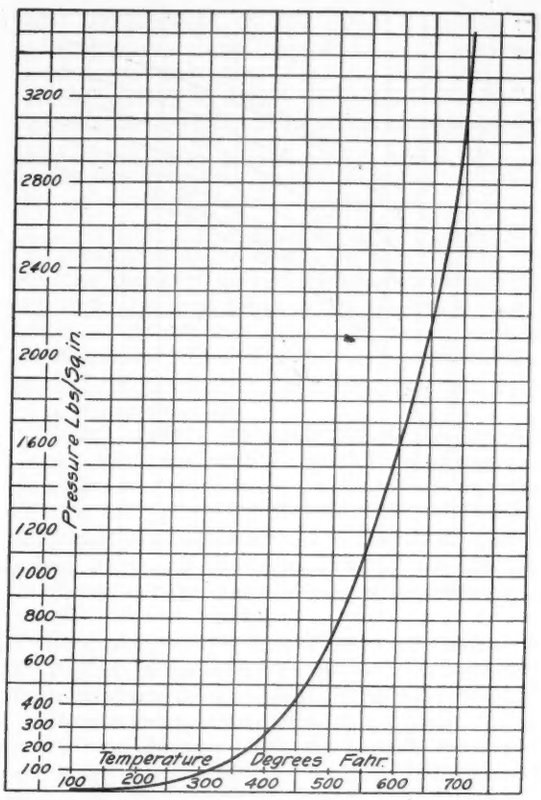


Fig. 8—Curve Showing Relation Between Temperature and Pressure of Saturated Steam.

down to pre-war figures, or very nearly to such figures, and it is equally probable that the cost of fuel will not. Under such circumstances the economic balance will probably be found to occur at a lower average rate of evaporation than some designers have expected.

One of the principal losses occurring with high boiler ratings results from high flue-gas temperature. This loss can be partly recovered by the use of economizers. However, economizers cost money to install, to maintain and operate, and the waste is therefore not entirely recoverable. Some designers of power plants appear to give inadequate weight to some of the costs incurred in the practical operation of economizers. It is rather interesting to note in passing that despite the increase in the price of coal during the past 6 yrs. the situation with respect to the installation of economizers has not materially changed. There are cases in which quotations on economizers increased during the same period at such a rapid rate that, despite the increasing cost of coal, the installation of economizers could not be justified.

Economizers, until quite recently, were made of cast iron exclusively. As the steam pressure in use has risen more and more engineers have begun to question the propriety of using cast iron for such apparatus. It seems certain that all will agree that if we adopt pressures like those we are now considering cast iron will be ruled out unless we operate the economizers at a pressure much below the boiler pressure. This introduces undesirable complications. Such considerations have led to the construction and use of wrought-steel economizers. These can be built with factors of safety equal to those used in boiler con-

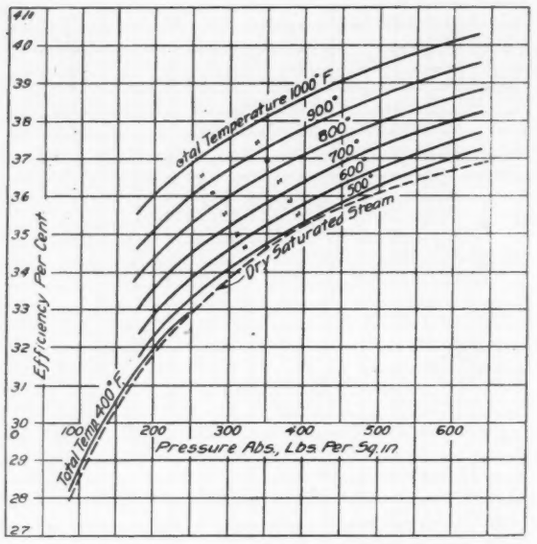


Fig. 9—Efficiency of Complete Expansion Cycle in Steam Turbines With 1 in. (Hg.) Back Pressure.

struction; they are practically as satisfactory as cast iron with respect to corrosion on the gas side, but they are much more apt to corrode on the water side. In modern plants such corrosion is generally due to dissolved oxygen, and can be prevented if proper precautions are taken to keep the boiler feed sufficiently free of this gas. There are now several well recognized methods of doing this.

Preheated Air to Be Employed in Boiler Furnaces.

Within the past few years another device has been introduced for conserving heat otherwise lost in flue gases. This is the air preheater. Air used for combustion must be heated to furnace temperature from the temperature at which it enters the furnace. Ordinarily this is done in the furnace at the expense of heat liberated by the fuel. That part of this heat which is required to raise the temperature to a value equal to that with which the flue gases leave the boiler is wasted through the boiler damper. If a large fraction of this heat could be conserved by transferring it from flue gases to entering air by means of an air preheater a fuel saving of 10% or more could be made. It does not seem probable that any such complete transfer can be effected in a real case, but some fraction of it is certainly attainable. It appears as though a saving of 3 to 5% might prove possible.

However, this device also introduces problems of its own. It can be built comparatively cheaply, but its use involves additional flues and fans and power for driving the fans so that the gross thermal gain in any case will be partly offset by increased thermal expenditure and increased capital charges. Further, it seems certain that air preheaters will present new cleaning and maintenance problems which will also yield items of expense which must be balanced against the gross thermal saving.

In addition to all these considerations we have another which may prove of still greater importance. We do not yet know the limiting temperature to which it is permissible to raise the air. The air supplied for burning fuel on the grate or stoker passes through that device and serves to cool it by removing heat which is radiated and conducted to it. It is certain that we can use air temperatures higher than those now common, but whether we will find 150 deg. F. or 300 deg. F. or 500 deg. F. to be the upper limit is still unknown. I am inclined to think that the upper limit will vary with the type of stoker, and it is obvious that it will vary with the rate of combustion.

Great improvements have been made in the character of boiler feed water used in the large plants of the country in the past decade. In the early days we used for boiler feed or make-up water anything which was readily attainable. If the scale deposited in the boiler was of such character as to cause too much trouble we treated the water chemically before use. But we still concentrated a chemical solution in our boilers, had to blow down the boilers at frequent intervals, and were forced to shut down and thoroughly clean out the boiler periodically. We have now greatly improved this practice in the case of plants using surface condensers. In such plants the greater bulk of the water evaporated in the boiler is used over and over, being contained in what one might call a practically closed circuit. There is a certain loss from leakage, blow down, spillage, etc., but this can be kept down to a value between 1 and 2% of the total boiler feed by careful management. The make-up required to make good this loss is now commonly distilled and enters the system as a vapor leaving dissolved salts behind in the evaporator.

With a plant operated in this way there is practically no deposit in the boiler. As a result blow-down losses are practically eliminated. Of still greater importance, however, is the fact that the expense of shutting down, opening up the boiler, and turbining the tubes is almost completely done away with. In this case the improvement results not so much in a thermal gain as in decreased labor and maintenance charges and better use of invested capital.

Many Factors Involved in Solution of Auxiliary Power Problem.

Much thought has also been given recently to different methods of obtaining auxiliary power and to different methods of heating the feed water. These factors are closely tied to the use of economizers and air preheaters, and that method which is best under one set of conditions is not necessarily usable with a different type of plant. We seem to be settling down to two different types, although the whole subject is as yet admittedly in a state of flux. In the one type steam-driven house generators are used to supply some or all of the auxiliary power. The steam exhausted heats the feed water in heater-condensers operating at such a vacuum as to give a feed-water temperature sufficiently low for advantageous use in economizers. In the other type the feed water is heated by steam withdrawn from the main unit. This heating is preferably done in stages, and if the idea is carried to the limit it results in the introduction of a cycle which is theoretically more efficient than the simple so-called Rankine cycle now in use. Unfortunately, if this arrangement is carried to the ultimate limit it yields feed water with a tem-

perature higher than can be used advantageously in economizers. It also has another disadvantage from the view point of the central station. Auxiliary power must logically be taken from the main bus, and continuity of service is correspondingly jeopardized.

No consideration of the evolution of power plants would be complete without a reference to the work which is being done in an effort to make available for use the poorer grades of fuel. Stokers are continuously under development, and we are already obtaining very promising results with fuels which only a few years ago were practically unusable. Further, many attempts are being made to introduce pulverized fuel into central station boiler rooms, and one large new plant is being completely equipped for the use of such material. Much is promised by the pulverized fuel advocates in the way of increased thermal efficiency, decreased labor charges and ability to use poorer grades of coal. As yet the case is not proven, but the experience of the next 5 yrs. should bring out the facts. It is my personal belief that the preparation of the fuel for the burner must be greatly simplified and cheapened before pulverized coal can compete with good stokers under central station conditions in most sections of the country, but I must confess that many engineers in the industry do not share this view with me.

Evaluation of Possible Improvements Now in Sight.

If we assume that we will continue to use steam turbines and other equipment of the present types, but that we will increase pressure and temperature to the limit and that we will introduce all possible heat-saving devices, we can lay down on paper a plant which should deliver a net kilowatt-hour for between 14,000 and 15,000 B. t. u. This would correspond to overall thermal efficiencies of the order of 24 or 23%. Our best plants of the present day give values of 18 to 19%. I am certain that with the fuel prices which are to be expected in this country in the immediate future such thermally efficient plants would not represent the best engineering or economic solution of the problem. The investment would in my opinion be higher than could be justified. On the other hand I do not expect to see a figure between 16,000 and 17,000 B. t. u. attained in the very near future.

INTERNATIONAL COMMERCE BODY OPPOSES PATERNALISM.

Report of Recent Meeting in London Where Prominent Part Is Taken by Representatives of United States Chamber of Commerce.

Among the resolutions adopted at the recent London meeting of the International Chamber of Commerce was one which declared that "Government control of or participation in industry and commerce discourages individual initiative and renders trade conditions uncertain and artificial." The resolution further set forth that Government control of industry and commerce should be discouraged and private enterprise encouraged in all lines of industry and commerce.

This resolution, with seven others, was introduced in the sessions of the production group, and was adopted by the whole congress. The other group sessions, Distribution, Transportation and Communication, Finance, and Devastated Areas, also contributed resolutions for the congress to act upon, in all, 29 resolutions were approved by the congress, all of which have been made public by the American Section of the International Chamber of Commerce.

Means of effecting economies as well as increasing production were discussed at the production group sessions. This was true especially of fuel, the production group declaring that "in addition to the measures taken to increase the production of fuel, it seems no less necessary to make every effort to make the best use of the coal at our disposal."

The Congress recommended that in countries which have not yet an organization studying the question of the economy of fuel, such an organization be created for this purpose; and that the International Chamber of Commerce get into touch with the different national organizations with a view to co-ordinating and diffusing the results of their work.

Economy in raw material also was urged in a resolution which pointed out that "the conservation of some of the world's natural resources is of paramount importance to the welfare of the world for the reason of the rapidly diminishing supply." It is urged that the International Chamber of Commerce take immediate steps to encourage research work and investigations in every possible way to lessen the waste in the production and utilization of raw materials, and to make available the results of such researches and investigations.

American Delegation Goes on Record for Standardization.

In accord with the view of the American delegation, the production group went on record in favor of standardization, holding that "standardization is of paramount interest from the standpoint of international commercial relations." The resolution adopted on this subject urged that in countries where there does not yet exist a standardization organization, such an organization be created for the purpose of studying this subject.

It was recommended by the congress that within the International Chamber of Commerce there be created industrial sections which will enable qualified representatives of each category of industrial or business men to get into touch with each other and discuss questions of international interest; that the International Chamber of Commerce get into touch with already existing permanent international federations or bureaus, such as construction, motor industry, cotton, production of books, etc., in order to co-ordinate the result of their work.

A. I. E. E. SECTION MEETS.

The Seattle section of the American Institute of Electrical Engineers held its annual banquet Tuesday evening, Sept. 20. Following the dinner there was given a demonstration of wireless telephony.

Telephone Equipment Employed in Train Operation

Use of Telephone for Train Dispatching Increases Speed and Decreases Errors in Transmission — Portable Equipment Carried on Trains and by Work Crews Adds to Operating Economy and Safety

By D. V. WEED, Jr.

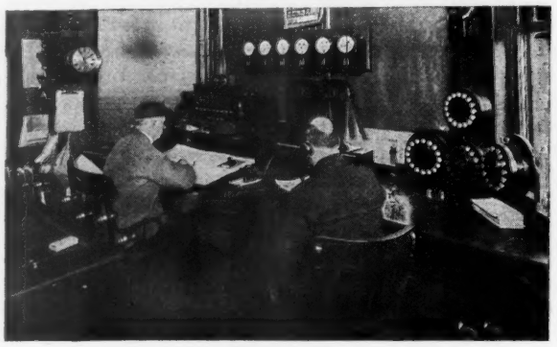
Although it was only in 1907 that the telephone was adopted for railroad train dispatching, its utilization has been so rapid that 317 railway systems in the United States, operating 23,644 mi. of road, now use the telephone exclusively for the work. The Western Electric Co., the largest manufacturer of telephone equipment, has given special attention to its production, with the result that many inventions have been brought forth and particularly efficient apparatus developed.

The telephone train dispatching line is essentially a party telephone line extending from the dispatcher's office to the various way-stations on his dispatching division. It consists of a metallic telephone circuit, to which certain calling apparatus is connected at the dispatcher's office, and an individual selector at each of the way-stations, in addition to the telephone apparatus. In the dispatcher's office the calling equipment is so arranged that a predetermined number of electrical impulses may be sent out at will to signal any one of the way-stations. These keys are so designed that the number of impulses sent by any one of them will actuate the corresponding selector at the way-station that is wanted. Therefore, only the station called answers when the dispatcher operates a key, and the average time required for establishing the connection is approximately 3 sec.

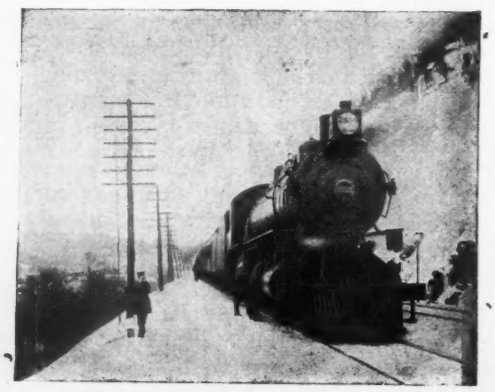
Dispatcher's Lines Permit Simultaneous Telephone and Telegraph Messages.

By simplexing and phantoming the train dispatching circuits, additional through telegraph and telephone circuits between terminal points or division headquarters may be obtained without any financial expenditure for increasing the outside wire plant.

When repeating coils or retardation coils are connected to the telephone circuit a simplex telegraph circuit results over which it is possible to carry on simultaneous telephone and telegraph communication over a single pair of wires without interference. When similar coils are connected to two existing metallic telephone circuits in such a manner that a third through telephone circuit is provided over the two pairs of wires, a phantom circuit is obtained. Thus, three telephone conversations may be carried on at the same time over the two original circuits, and practically every railroad having message or commercial circuits paralleling their train dispatching lines is using these wires to secure an additional circuit by means of the phantom.



Typical Train Dispatcher's Office—From This Office Telephone Connections Are Made With Any Way-Station in 3 Sec.



Train Conductor Using Portable Instrument to Report Delay of Train.

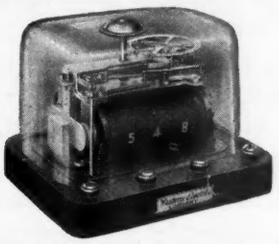
Advantages of Verbal Dispatching in Supervision of Train Movement.

It is obvious that the telephone has many advantages in train dispatching. The dispatcher issues his orders verbally and complete reports of the passing, arrival and departure of trains can be given in the fractional part of a minute, while information regarding accidents and other occurrences outside of the daily routine may be transmitted verbally in such complete form that the chances of misunderstanding, or necessity for additional messages, are practically eliminated.

The loud-ringing bell of the telephone insures an immediate response. Also, on heavy traffic divisions where there is a high rate of calling, the ability to call on the telephone line other stations while a message is being transmitted, has proved very advantageous. The great accuracy of the telephone in transmitting orders is testified by the fact that, since the adoption of the telephone for directing train movements, not a single accident has resulted from its use.

Of course, the use of the telephone is not limited to the dispatchers and station operators.

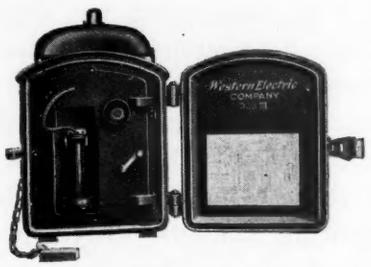
Crews of passenger, freight and wreck trains are supplied with portable telephones by which they can get into immediate touch with headquarters in case of a breakdown or other accident occurring between stations, while these instruments have proved a great aid in the performance of the work of construction and bridge gangs. Also, track inspectors have prevented serious catastrophes by using this portable apparatus to report discovered washouts, loose rails, landslides



Western Electric Selector No. 60A, Alternating Current, Glass Inclosed.

or other sources of track trouble. These sets are provided with a line pole so that connection can be made at any point along the right-of-way.

In addition to the regular station sets, it is the policy of all railroads to install a large number of booth telephone sets along the right-of-way at passing tracks and sidings. Since these sets are connected to the dispatcher's line, the number of these booths will ordinarily exceed that of the regular stations. Another use of the telephone is for manual blocking. This service is very extensively used, particularly on roads not equipped



Siding Telephone Inclosed in Moisture-Proof Box.

with automatic block signals. The apparatus consists of magneto telephone sets connected to a circuit approximately 5 mi. long and extends only to the next blocking office.

All yards are equipped for telephone service between switch shanties, towers and yardmasters' offices, while at all terminals there are telephones installed for transacting commercial business with the public.

The use of the telephone for train dispatching is not by any means confined to the United States and Canada, but has been adopted throughout the world and, in 1914, 16 foreign railroads were operating over 1300 mi. of telephone circuits.

UTILITY ENLARGING FACILITIES.

Blue River Power Co., Seward, Neb., advises that it is finishing one small hydroelectric plant and just commencing work on another to be completed by the first of the year. The company is also making transmission line extensions to three additional plants.

FOREIGN HONORS BESTOWED UPON AMERICAN ENGINEERS.

With the presentation of the John Fritz Medal to Eugene Schneider, head of the famous Creusot Works in Paris recently by a mission of American engineers, came cable advices from London to the national headquarters of the American Society of Mechanical Engineers in New York City announcing that more foreign honors had been conferred upon Americans distinguished in the engineering profession. The cable message, addressed to Secretary Calvin W. Rice, stated that Ambrose Swasey, of Cleveland, sponsor of the Engineering Foundation and past president of the American Society of Mechanical Engineers, had been elected to honorary membership in the British Institution of Mechanical Engineers, in the British Institution of Mining and Metallurgy and British Institution of Mining Engineers.

Charles F. Rand, of New York City, it was stated, had been elected an honorary member of the Institution of Mining and Metallurgy, and of the Institution of Mining Engineers. Mr. Rand, who is chairman of the executive board of the Engineering Foundation, has just been made an honorary member of the British Iron and Steel Institute. Other elections announced by cable were those of Col. Arthur S. Dwight, of New York City, and William Kelly, of Vulcan, Mich., to honorary membership in the Institution of Mining Engineers. This group of honors is believed to be without precedent in engineering and was described by Mr. Rice, who has been active in promoting closer relations between American and British engineers, as an important step in bringing about world solidarity in the engineering profession. A movement, it was said, has been started in the direction of federating the engineering societies of the British Empire according to the general plan adopted by Herbert Hoover and his associates in organizing the Federated American Engineering Societies, in which are gradually coalescing the national and local engineering organizations of the United States.

The ceremonies in Paris, participated in by a special deputation of 13 American engineers under the general chairmanship of Mr. Swasey, followed like ceremonies earlier in London, when the John Fritz Medal for distinction in applied science was presented to Sir Robert Hadfield, known for his work in the development of manganese steel. The Hadfield award was for 1921 and the Schneider award for 1922. M. Schneider received the gold medal in person for his achievements during the war "in the industrial and scientific defense of civilization." The John Fritz Medal Board of Award, in conferring the honor, lauded M. Schneider's "achievements in the metallurgy of iron and steel, in the development of ordnance, especially the 75 mm. gun, and in notable patriotic contributions to the winning of the war." The cablegram announcing the conferring of the honors said that the American engineers were being received with marked courtesy in both England and France. Mr. Rand, it was said, becomes one of five honorary members of the Iron and Steel Institute, the others being the Prince of Wales, King Albert of Belgium, and Dr. Richard Akerman and Baron Gustaf Tamm of Stockholm.

EDITORIAL COMMENT

Forty Years of Electrical Progress

The **Electrical Review** is the oldest electrical journal now published in America.

The "Journal of the Telegraph" was established by James D. Reid, editor, in December, 1867, and was the first publication of an electrical character. It was discontinued December 20, 1914. Another telegraph journal entitled "The Operator", edited by W. J. Johnston, was issued in March, 1874, and continued until September, 1885, when it was made into "Johnston's Journal: An Illustrated Magazine for the People". This publication did not succeed and was soon discontinued.

"The Review of the Telegraph and the Telephone" was started by George Worthington, editor and publisher, February 15, 1882, and its title was abbreviated by him to **Electrical Review** March 22, 1883. Having been published consecutively under direct, connected management and name since February, 1882, the **Electrical Review,** therefore, is the oldest American electrical journal published today, preceding all the several other electrical publications now issued. It rightfully possesses whatever prestige belongs to the living pioneer, and its present editor has been identified with it constantly since 1883—five years more than a third of a century.

Early in March of the coming year the **Electrical Review** will celebrate the fortieth anniversary of its birth, and in connection with this event we shall have some important announcements to make. During this long publishing period it has given a character of service which we believe has been unrivaled by any other periodical in the same field. Today it is the only electrical paper that consistently covers the varied and correlated activities of the entire industry. The first issues were devoted principally to the telegraph and telephone, those being the principal uses to which electricity was then applied. As the lighting industry developed, the **Electrical Review** took up that feature of electrical activity and has since published more in relation to it than probably all other electrical papers in the United States put together. With the growth of power plants, it also kept pace. When the merchandising of electrical devices began to develop the **Electrical Review** led every phase of that branch of the industry. New construction, electric wiring and general electrical contracting have also been adequately covered.

In all of this, the **Electrical Review** has worked in season and out of season to develop co-operation between the various branches of the electrical industry. Many of the leaders of the industry have spent years to develop co-operation between these various branches. They recognize that the life of the industry and its future development depend upon complete understanding between the central stations, manufacturers, jobbers, engineers, contractors and dealers. Each must know the fundamentals of the others' problems and co-operate for the future, or the growth of the industry will be stunted. The **Electrical Review** has always realized that, as the industry develops, every division of the industry will depend more and more upon the other branches. Take two of the extremes in this matter, viz., the manufacturers of electrical devices, to be used in connection with electrical installations in industrial plants and central stations, and their customers. There is a tremendous amount

of this material that is universally used. The electrical dealer today is just waking up to the possibilities of selling such products to the industries of his community. The next few years will see rapid development in this work. When a manufacturer has received a motor that is to be installed, or a motor-driven piece of equipment, he will know that the necessary switches, outlet boxes, etc., can be purchased from the progressive electrical dealer in his community. The development of the dealer from handling domestic appliances to a full line is the next aggressive step in merchandising electrical devices and it is the one step that is going to have far reaching effect upon the future of electrical development. These dealers must be educated regarding the principles of merchandising and the use of these devices in application. The central stations and manufacturers must also know and keep abreast with conditions, so that they will be conversant with the merchandiser's problems and realize the possibilities of his future development. The growth of progressive dealers in a community is going to build up a tremendous good will and support to the central stations that will be invaluable to them in establishing a better understanding in the community as to public utilities.

The **Electrical Review** has always recognized the need of this co-operation or understanding of the various branches of the industry and it has constantly supported the leaders in their activities in the electrical field. At the time of the organization in 1885 of the National Electric Light Association, through the instrumentality of the **Electrical Review,** the present editor-in-chief (who was associate editor at that time) urged that the operating and manufacturing interests co-operate, and this was agreed upon. A few years later this was changed and the central station interests for many growing years were in sole control of the association. In recent years, however, it has been deemed best to return to the first plan, and the operating and manufacturing interests of this stupendous branch of the electrical industry are most admirably and comprehensively, with paralleling responsibilities, co-operating in directing the destiny of the National Electric Light Association—the strongest and most influential practical electrical association in the world. Thus does history repeat itself—and, perhaps, a prophet of old may claim a measure of vindication!

To co-operate and carry the message of one branch of the industry to the other and also furnish valuable editorial contents for the benefit of each branch of the industry is the real purpose of **Electrical Review.** This is a policy that has been maintained since the birth of the publication early in 1882.

The **Electrical Review** stands as the only publication that is not narrowly specializing in some branch of the industry. Our position is that co-operation cannot be built up by dividing any given field. As a weekly publication, we give to the industry annually nearly 3000 pages of editorial contents. In this manner we assign to each branch of the industry the necessary quota of editorial contents so that the live news of the field can be published without using a great amount of filler that is of little interest to the industry. Where we do specialize is in featuring each week a different branch of the industry. The first issue of each month is devoted to Electrical Construction and Development, the second weekly issue treats of Electric Lighting in all its phases, the third issue covers the Power Plant and its operation, while the fourth issue of each month editorially deals with Contractor-Dealer problems.

Through this wide and varied editorial policy, the **Electrical Review** has developed a following of the real leaders from all the important branches of the industry and one that it will earnestly strive to maintain in middle age and beyond, as well as it has done in its youth. CHARLES W. PRICE, Editor.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

SOUTHEASTERN DIVISION TO MEET AT CHATTANOOGA.

The tentative program prepared for the annual convention of the Southeastern Geographic Division of the National Electric Light Association, to be held at Chattanooga, Tenn., Oct. 17-19, provides for addresses by the following prominent men in the electrical industry: M. R. Bump, president, and M. H. Aylesworth, executive manager, National Electric Light Association; W. L. Goodwin, Society for Electrical Development; Thomas W. Martin and F. D. Mahoney, Alabama Power Co., Birmingham, Ala. It is expected that Martin J. Insull, past president of the National Electric Light Association, will address the members Oct. 18.

The delegates will be welcomed by the mayor of Chattanooga, and the response made by Judge Lindsey, of Knoxville, Tenn. This will be followed by the address of President S. B. Irelan, Montgomery, Ala. The report of the Overhead Systems Committee will be submitted by W. K. Vanderpoel. In addition, papers will be presented by G. A. Sawin, Westinghouse Electric & Manufacturing Co., and a representative of the Edison Lamps Works of General Electric Co.

COMMITTEES OF NORTH CENTRAL DIVISION, N. E. L. A.

The following committee appointments for the ensuing year have been announced by T. D. Crocker, president, North Central Geographic Division of the National Electric Light Association:

Committee on Telephone Inductive Interference, G. O. House, Northern States Power Co., St. Paul, and S. B. Hood, Minneapolis General Electric Co.; Committee on Rural Line Extensions, R. M. Howard, Winona, chairman; F. K. Shuff, Hartford, S. D.; A. H. Savage, St. Paul, and C. S. Kennedy, Fergus Falls, Minn.; Committee on Co-operation of Electrical Interests, H. F. Thomas, St. Paul, chairman; F. T. Langford, Minneapolis, and W. S. Heald, Duluth, Minn.; Committee on Public Relations, R. F. Pack, Minneapolis, chairman; C. E. Van Bergen, Duluth, Minn., and A. H. Savage, St. Paul; Committee on Accounting, F. C. Hoffman, St. Paul Gas Light Co.; J. W. Turner, Duluth Edison Co.; J. J. Molyneaux, Northern States Power Co., Minneapolis, and L. W. Hase, Redfield, S. D.; Membership Committee, W. E. Skinner, Minneapolis; G. E. Quarnstrom, Madison, S. D., and M. L. Hibbard, Fargo, N. D.; Commercial Committee, W. S. Heald, Duluth Edison Co.; Lee Boyer, Consolidated Light & Power Co., Deadwood, S. D.; H. E. Young, Northern States Power Co., Minneapolis, and Harvey Keppler, Fargo, N. D.; Technical Committee, S. B. Hood, Northern States Power Co., Minneapolis; A. V. Taylor, Little Falls (Minn.) Power Co.; F. K. Shuff, Hartford (S. D.) Light & Power Co., and A. R. Frahm, Union Light & Power Co., Fargo, N. D.; Committee on Constitution and By-laws, O. A. Rofelty, Northern States Power Co., Sioux Falls, S. D.; D. W. Flowers, St. Paul Gas Light Co.; H. E. Swanson, Rochester, Minn., and J. F. McGuire, Minot, N. D.

DISCUSS PROBLEMS OF INDUCTIVE INTERFERENCE.

Rocky Mountain and Colorado Associations in Joint Meeting Consider Electric Utility Financing and Other Important Subjects.

The establishment of an understanding on the part of the consuming public of the problems of the electric utility companies was the keynote of the combined annual conventions of the Rocky Mountain Geographic Division of the National Electric Light Association, the Colorado Electric Light, Power and Railway Association and the National Accounting Section of the National Electric Light Association held at Glenwood Springs, Colo., Sept. 19-21.

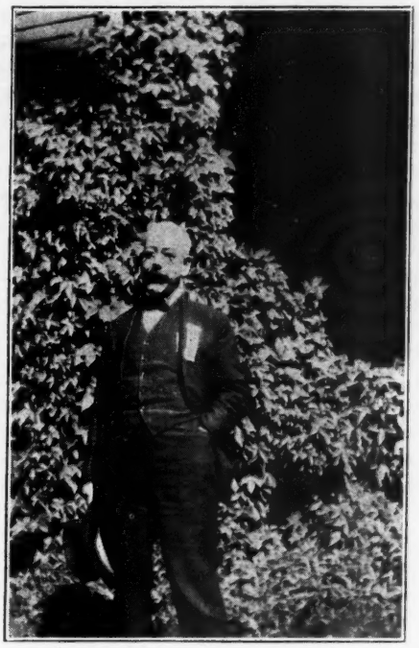
T. O. Kennedy and E. A. Phinney at Glenwood Springs Convention.

The meeting was attended by 150 delegates, a majority of whom have been regular attendants at the previous conventions of the Colorado Association. It was the 18th annual convention of that Association and the second annual convention of the Rocky Mountain Geographic Division of the National Electric Light Association, and the first of a national nature connected with the N. E. L. A. to be held west of Chicago.

The problem of inductive interference and similar subjects of mutual interest to the electrical industry received the support of the telephone, telegraph and electric light and power company delegates. The Mountain States Telephone & Telegraph Co. and the Western Union Telegraph Co. were represented by the ranking officials of the Rocky Mountain region.

In a number of addresses the subject of tax-

free securities and kindred evils of the financial world were emphasized. The relationship of these problems of financing the electric utility companies and the serious condition found in



S. E. Doane, Who Spoke on Electrical Illumination.

many parts of the country showed to the convention that relief must be afforded in the near future in this competitive situation or a large number of companies would go out of business.

The delegates were officially welcomed to Glenwood Springs by Mayor W. G. McDonald, who spoke of the constructive work which is being done by these two organizations.

President C. A. Semrad, of the Colorado Electric Light, Power and Railway Association, spoke briefly on the work accomplished by his organization during the last year and made suggestions relative to possibilities for the future.

S. E. Doane, chief engineer, National Lamp Works of the General Electric Co., Cleveland, gave a very interesting address on electrical illumination, an industry that was yet in its infancy. Mr. Doane predicted many wonderful things in the way of electrical illumination in the future, developments and results that would eclipse anything that has been done in the past.

The national financial situation was brought forcibly before the convention by Frank N. Briggs, president, Interstate Trust Co. of Denver.

The first afternoon's session was devoted to the National Electric Light Association. E. A. Phinney, president, Jefferson County Power & Light Co., Golden, Colo., who is president of the Rocky Mountain Geographic Division of the National Electric Light Association, gave a resume of the last year's work.

Problems Confronting Electrical Industry Enumerated by President Bump.

M. R. Bump, president, National Electric Light Association, recounted in detail the problems confronting the electrical industry and the plans for financing local power companies. The plans of the Association are exceedingly comprehensive in scope, as it is the intention that the consuming public be fully informed regarding the exact condition of its activities.

Ben S. Reed, president, Mountain States Telephone & Telegraph Co., spoke of the necessity of utilities having the good will and entire confidence of the public. Mr. Reed also touched upon the subject of regulatory commissions.

"When the consumers are told the truth about the public utilities serving them, then will there come that understanding of mutual helpfulness and desire of the public to assume part of the burdens of operation," according to M. H. Aylesworth, executive manager, National Electric Light Association, who addressed the opening session of the second day's meeting.

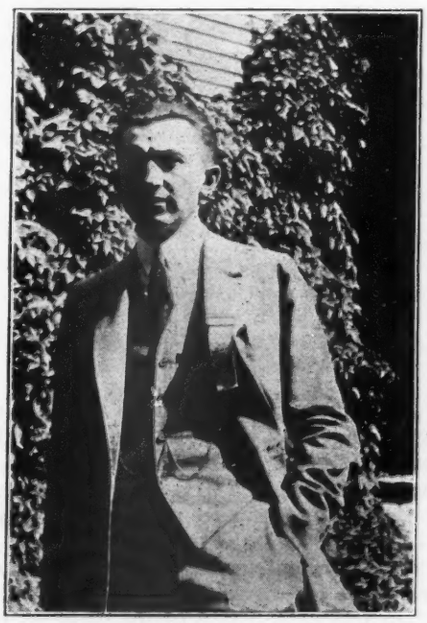
F. C. Hamilton, rate expert of New York City, emphasized the necessity of thoroughly explaining to its consumers all the innermost details of the companies' operations.

"How to Reverse Radical Sentiment" was the subject of an address by Fred R. Marvin, editor, *Mountain States Banker,* Denver.

"Latest Developments in Street Lighting Equipment" was the subject discussed by L. A. S. Wood, George Cutter Works of the Westinghouse Electric & Manufacturing Co., South Bend, Ind. Grant E. Halderman, chairman, Colorado Public Utilities Commission, and S. W. Bishop, executive manager, Denver Electrical Co-operative League, also addressed the convention.

The meetings of the last day were given over to business and to hearing the work done by the National Accounting Section of the National Electric Light Association, through E. J. Fowler, the chairman, who is the statistician of the Commonwealth Edison Co., Chicago.

The officers elected for the year 1921-1922 of the Colorado Association are: President, Fred



C. A. Semrad, Past President Colorado Association.

Norcross, general manager, Home Gas & Electric Co., Greeley, Colo.; first vice-president, Walter F. Brown, general traffic manager, Mountain States Telephone & Telegraph Co., Denver;

second vice-president, C. R. Rudy, Colorado Power Co., Denver, and secretary-treasurer, Miss Minnie B. W. Baker, Denver Gas & Electric Light Co., 900 Fifteenth street, Denver.

The Rocky Mountain Geographic Division of the National Electric Light Association elected the following officers: President, T. O. Kennedy, general superintendent, Denver Gas & Electric Light Co.; first vice-president, E. P. Bacon, Natrona Power Co., Casper, Wyo.; second vice-president, Arthur Prager, Albuquerque (N. M.) Gas & Electric Co.; third vice-president, D. C. McClure, Denver Gas & Electric Co., and secretary-treasurer, A. C. Cornell, Western Electric Co., Denver.

DATA ON EXPORTS OF ELECTRICAL GOODS.

August, 1921, Total Is $6,057,489; a Decrease of $1,052,796 Compared With Same Month Last Year—Figure for 8 Mo. Is $76,471,045.

The exports of electrical goods to foreign countries for August were valued at $6,057,489, compared with $7,110,285 for the corresponding month of 1920, or a decrease of $1,052,796. For the 8 mo. ending August, 1921, the total exports amounted to $76,471,045, an increase of $16,108,157 over the 1920 figures and an increase of $14,151,429 over the total for the 8 mo. ending August, 1919.

The following classified figures give the detailed data for August, 1921, compared with the corresponding month for the previous year:

Electrical machinery and appliances, (except locomotives)	August, 1920.	August, 1921.
Batteries	$ 444,859	$ 175,878
Carbons	174,910	27,110
Dynamos and generators	659,200	641,818
Fans	54,911	32,232
Heating and cooking apparatus	118,817	69,660
Insulating wire and cables	420,208	305,829
Interior wiring supplies, including fixtures	241,425	69,386
Lamps—		
Arc	711	184
Incandescent—		
Carbon filament	2,787	8,051
Metal filament	213,615	86,746
Magnetos, spark plugs, etc.	169,543	71,145
Meters and measuring instruments	152,696	116,820
Motors	845,839	959,773
Rheostats and controllers	30,818	64,456
Switches and accessories	283,900	184,555
Telegraph apparatus, including wireless	31,903	26,697
Telephones	218,073	321,887
Transformers	721,507	796,292
All other	2,324,563	2,098,969
Total electrical machinery, etc.	$7,110,285	$6,057,489

WHAT AND WHY IS FIRE PREVENTION DAY?

On Oct. 9, 1871, a fire said to have started in a cow stable in Chicago, spread so rapidly that it was soon out of control. Before it was finally extinguished it had taken a toll of 200 lives, and caused property damage amounting to approximately $187,000,000. Tradition has it that a cow belonging to a certain Mrs. O'Leary kicked over a lantern in the cow barn and started the fire. Whether this explanation of the cause of the fire is true remains a matter of conjecture, but the appalling loss of life and property has gone down in history as an absolute fact.

Since Oct. 9, 1871, the fire loss in the United States has been gradually increasing until at present it has reached the enormous figure of $500,000,000 a year. Records show that 15,000 people annually lose their lives because of fire, and 60,000 others are maimed. The appalling loss has finally caused a nation-wide effort to check the ravages of fire, and consequently the date of the big Chicago fire has been designated as Fire Prevention Day. Many large national organizations are behind the fire prevention movement and for a number of years not only has Fire Prevention Day been observed, but in many sections an entire week has been set aside as a time to eliminate fire hazards, plan fire prevention campaigns, and spread educational propaganda intended to awaken the general public to the enormity of the fire losses.

This year Fire Prevention Week will be observed on a larger scale than ever before. As the anniversary of the Chicago fire comes on Sunday, the following day, Monday, Oct. 10, will be observed. But, starting with the first day of October the fire prevention campaign will be carried out in every part of the country until the final activities on Fire Prevention Day.

The necessity for the observance of Fire Prevention Day has been so widely recognized that Oct. 9 has been set aside for this purpose by presidential proclamation in this country, and royal proclamation in Canada. Chambers of Commerce, Woman's Clubs, Boy Scouts, schools and civic organizations in all parts of the country have taken an interest in this matter, and practically everywhere programs are carried out with the hope of arousing the people against carelessness toward fire. It is estimated that 75% of all fires are preventable. By exercising ordinary care a large amount of the fire loss can be done away with—thousands of lives can be saved, and untold suffering eliminated.

Although Oct. 1 to 10 has been officially designated as Fire Prevention Week, every week should be a fire prevention week. The occasion is not one of celebration, and never will be until the fire loss is banished and Americans have a real reason to rejoice over the fruits of their endeavors toward fire prevention.

ANNUAL REPORT OF THE ONTARIO HYDRO-ELECTRIC COMMISSION.

The 13th annual report of the Hydro-Electric Power Commission of the province of Ontario, Canada, for the year ended Oct. 31, 1920, is most comprehensive and illuminating. The Hydro-Electric Power Commission operates nine systems, viz., Niagara, Eugenia, Wasdell's, Severn, Thunder Bay, Muskoka, St. Lawrence, Rideau and Central Ontario, and has jurisdiction over the Queenston-Chippewa development. The report gives detailed information on the operation and development of each system during the past year and many charts present the data in graphic form.

Demand for power on the Niagara system increased to such an extent that additional power had to be bought from the Canadian Niagara Power Co., but even then the electric requirements of municipalities had to be restricted during some periods. On the Eugenia system the work of extending the transmission lines to additional municipalities and constructing new stations proceeded as planned while Wasdell's and

the Severn systems had their power demands somewhat reduced by the general industrial depression. The Thunder Bay system at present supplies only the city of Port Arthur but, in the near future, the city of Fort William will take power from the new Niagara plant.

It is expected that the large Cornwall substation of the St. Lawrence system will have its load so increased during the coming year as to necessitate an extension being made. The demands for power on the Rideau system have steadily grown and in May, 1919, a station at High Falls was put into service. Additional generating capacity was deemed essential on the Central Ontario system and, therefore, at Ranney's Falls a new generating station, which will add 10,000 hp. to the capacity of the system, is under construction.

Progress on construction of the Queenston-Chippewa development was considerably impeded by unsettled labor conditions, but electrically operated shovels are now excavating at the rate of 500,000 cu. yds. per mo. The construction of the powerhouse is well under way, the substructure of the building being already completed. The concrete walls are being poured and work on the construction of the roof of the building commenced. During the past year the Commission has contracted for three additional complete generating units, so that the initial installation in the plant will be five units instead of two. These generators are believed to be the largest of their kind in the world and each has a capacity of 55,000 hp.

MILWAUKEE EXTENDS INVITATION TO FIXTURE MARKET.

F. A. Coffin, of the Milwaukee (Wis.) Electric Railway & Light Co., gave an invitation in behalf of the electrical interests and business men of Milwaukee to the delegates and visitors at the recent convention of the Great Lakes Geographic Division of the National Electric Light Association, to attend the Lighting Fixture Market to be held in Milwaukee Jan. 30-Feb. 4, 1922. In addition to the Fixture Market other activities in Milwaukee during the same week will include the annual convention of the Lighting Fixture Dealers' Society of America, Jan. 30-Feb. 3; the annual convention of the National Council of Lighting Fixture Manufacturers, Jan. 30-Feb. 4, and the annual convention of the Illuminating Glassware Guild. Milwaukee will also have a "Better Lighting Week" at the same time. It is promised that there will be activity enough to make it well worth while to attend.

TELEPHONE PIONEERS WILL HOLD CONVENTION IN ST. LOUIS.

The 10th anniversary celebration and annual meeting of the Telephone Pioneers of America will be held at St. Louis, Oct. 24-25, with headquarters at the Hotel Statler. The business meeting will be held in the morning of Monday, Oct. 24, at which President H. B. Thayer will preside. Following the completion of the routine business the meeting will resolve itself into a general "get-together" session with informal talks by Pioneers, music and singing.

An entertainment will be held at the Municipal theater, Forest Park, on Monday evening, Oct. 24, the main feature of which will be a demonstration of the "Bell Loud Speaker" under the direction of John J. Carty, vice-president of the American Telephone & Telegraph Co., in charge of development and research. On Tuesday evening, Oct. 25, the annual banquet will be given by the American Telephone & Telegraph Co.

NEW OFFICERS ELECTED BY STEEL ELECTRICAL ENGINEERS.

At the 15th annual convention of the Association of Iron and Steel Electrical Engineers, held in Chicago last week, the following officers were elected: President, W. S. Hall, Illinois Steel Co., South Chicago, Ill.; first vice-president, R. B. Gerhardt, Bethlehem Steel Co., Sparrows Point, Md.; second vice-president, L. F. Galbraith, West Penn Steel Co., Brackenridge, Pa.; treasurer, James Farrington, La Belle Iron Works, Steubenville, O.; secretary, J. F. Kelly, Empire building, Pittsburgh; directors, R. R. Shepperd, Steel & Tube Co. of America, Indiana Harbor, Ind.; I. N. Tull, McKinney Steel Co., Cleveland; F. H. Woodhull, Lykens Steel Co., Coatesville, Pa., and W. H. Gilbert, Tennessee Coal, Iron & Railroad Co., Fairfield, Ala.

Who Said "Hard Times?"

Charles G. DuBois, president of the Western Electric Co., has just issued the following statement:

"The Western Electric Co. reports sales for the 8 mo. ending Aug. 31 as approximately $122,000,000, or almost the same as for the similar period of 1920.

"Since the beginning of the year the company has reduced its floating debt by $7,500,000, and has increased its cash balance by $6,000,000, an improvement of $13,500,000 in its financial position."

LIGHTING FIXTURE SOCIETY NAMES CONVENTION COMMITTEES.

As previously announced, the next annual meeting of the Lighting Fixture Dealers' Society will be held during the week of the Fixture Market in Milwaukee. Convention sessions will be held on the mornings of Jan. 30, 31, Feb. 1 and 2. It is the desire of the Executive Board that such subjects be brought before the convention as will prove of interest to the members and the Board recommends that each dealer send suggestions of subjects that he desires discussed.

Arthur Polacheck, general chairman of the Milwaukee Committee, has made the following appointments for chairmen of the various subcommittees: Entertainment, Phil Polacheck; publicity, A. M. Kailing; finance, Charles Gezelschap, Sr.; hotel reservations, Charles Bridges; window display, P. Sprecher; registration, Paul Burrell, and transportation, H. E. Brauns.

The Milwaukee electrical interests are going to put on a "Better Lighting" campaign, which will culminate at the time of the Fixture Market, and

the following is a list of the members of the Better Lighting Campaign Committee: F. A. Coffin, Local Electrical Co., chairman; F. A. Raatz, Cutler-Hammer Manufacturing Co.; H. Trester, Electrical Society; F. A. Baugh, Engineering Society; H. C. Hutton and Phil Polacheck, Contractors' Society; M. Massino, Retail Dealers' Society, and J. A. Sable, Manufacturers' Society.

PACIFIC RADIO TRADE ASSOCIATION TO AID AMATEURS.

With a slogan of "Better Service to the Radio Amateur," the Pacific Radio Trade Association has been organized with headquarters at 151 Minna street, San Francisco. Membership includes radio manufacturers, jobbers, dealers and advertising men. The prime purpose is a cooperative effort to popularize the use of radio apparatus. The first step in this direction will be a joint exhibit and demonstration of radio equipment at the California Industries Exposition, Nov. 19 to Dec. 20.

The officers of the new association are: President, Arthur H. Halloran, editor of *Radio*; vice-president, Ellery W. Stone, Pacific Supplies Co.; secretary-treasurer, Max Lowenthal, Globe Commercial Co.; directors: E. T. Cunningham, Remler Radio Manufacturing Co.; A. F. Pendleton, Radio Telephone Shop, and C. B. Kennedy, Colin B. Kennedy Co.

WESTINGHOUSE CO. GETS CHILEAN CONTRACT.

A contract to electrify the Chilean state railroad between Valparaiso and Santiago, at a cost of $7,000,000, has been awarded to the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., it was announced Sept. 28. The equipment to supply the road includes passenger and freight locomotives, electrical appliances and substation materials.

GENERAL ELECTRIC CUTS SALARIES OF ALL EMPLOYES.

A reduction of 10% in the salaries of all officers and employes of the General Electric Co. has been announced by President E. W. Rice, Jr., in the following brief statement:

"In accordance with an order of the Board of Directors a reduction of 10% will be made as of Oct. 31, 1921, in the salaries of all officers and employes of the company. Heads of departments are requested to notify all those affected."

THE NEW YORK ELECTRICAL SHOW OPENS ITS DOORS.

With a blaze of light midst which thousands of visitors viewed the latest electrical contrivances the 14th annual New York Electrical Show opened last Wednesday night. The spacious Armory drill floor was laid off in six bazaar-like streets lined with miniature shops exhibiting more than 400 electrical appliances, and the public found many new and novel devices to attract its interest. An electrically operated tooth brush with a detachable brush for each member of the family; electrically equipped bedroom furniture, and an animated machine that can wash and wipe dishes, sharpen knives and whip cream, were a few of the noteworthy new features.

The following exhibitors give an indication of the scope of the exposition: Edison Storage Battery Co.; Electric Storage Battery Co.; Gillespie Eden Corp.; Hoover Suction Sweeper Co.; Hurley Machine Co.; Landers, Frary & Clark; Rawlplug Co.; Steinmetz Electric Motor Car Corp.; Western Electric Co., and the Westinghouse Electric & Manufacturing Co. The two large lighting companies—the New York Edison Co. and the United Electric Light & Power Co.—had large and variegated displays.

WASHINGTON STATE ASSOCIATION ELECTS OFFICERS.

The Washington State Association of Electrical Contractors and Dealers, at its recent annual convention at Yakima, Wash., elected officers as follows: President, A. J. Gladson, Yakima; vice-presidents, J. J. Agutter, V. S. Kenney, and G. Hepler, Seattle; U. Tingling, Spokane; F. S. Mallidge, Wenatchee; David T. Dickman, Tacoma; Ralph Wiseman, Ellensburg; A. S. Clark, Bellingham. Stephen I. Miller, William Meacham, Seattle, and Ralph Wiseman were elected representatives of the Northwest Electric Service League, of which Mr. Miller is secretary-manager, with offices at Seattle.

COMING CONVENTIONS.

New York Electrical Show, 71st Regiment Armory, Park avenue and 34th street, New York City, Sept. 28-Oct. 8. General manager, George F. Parker, 124 West 42d street, New York City.

Cleveland Section of the American Society of Mechanical Engineers. Great Lakes regional meeting, Cleveland, Oct. 3-4. James Guthrie, Fidelity building, Cleveland.

Indiana State Association of Electrical Contractors and Dealers. Annual convention, Indianapolis, Oct. 5-6. Headquarters, Claypool hotel. Secretary, A. I. Clifford, 507 Odd Fellows building, Indianapolis.

Empire State Gas and Electric Association. Annual convention, Lake Placid Club, N. Y., Oct. 6-7. Secretary, C. H. B. Chapin, Grand Central Terminal, New York City.

Southeastern Geographic Division of the National Electric Light Association. Annual convention, Chattanooga, Tenn., Oct. 17-19. Headquarters, Signal Mountain Inn. Secretary, Charles A. Collier, Electric and Gas building, Atlanta, Ga.

Electrical Supply Jobbers' Association. Quarterly meeting of Atlantic Division, Bellevue-Stratford hotel, Philadelphia, Oct. 20.

Telephone Pioneers of America. Tenth anniversary celebration and annual meeting, St. Louis, Oct. 24-25. Headquarters, Hotel Statler. Secretary, R. H. Starrett, 195 Broadway, New York City.

Electrical Exposition, Auditorium, Milwaukee, Oct. 25-31, under auspices of the Milwaukee Chapter of the Wisconsin State Association of Electrical Contractors and Dealers, in connection with the Third Annual Food and Household Exposition, directed by the Milwaukee Journal.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland.

OPERATING PRACTICE

Methods and Problems Embracing Operation and Installation of Power-Plant Equipment and the Distribution of Electrical Energy

MANY NEW GENERATORS ON TEST AT THE SAME TIME.

Large and Small Units Crowd Test and Assembly Floor—Machines Built for Many Large Central Stations.

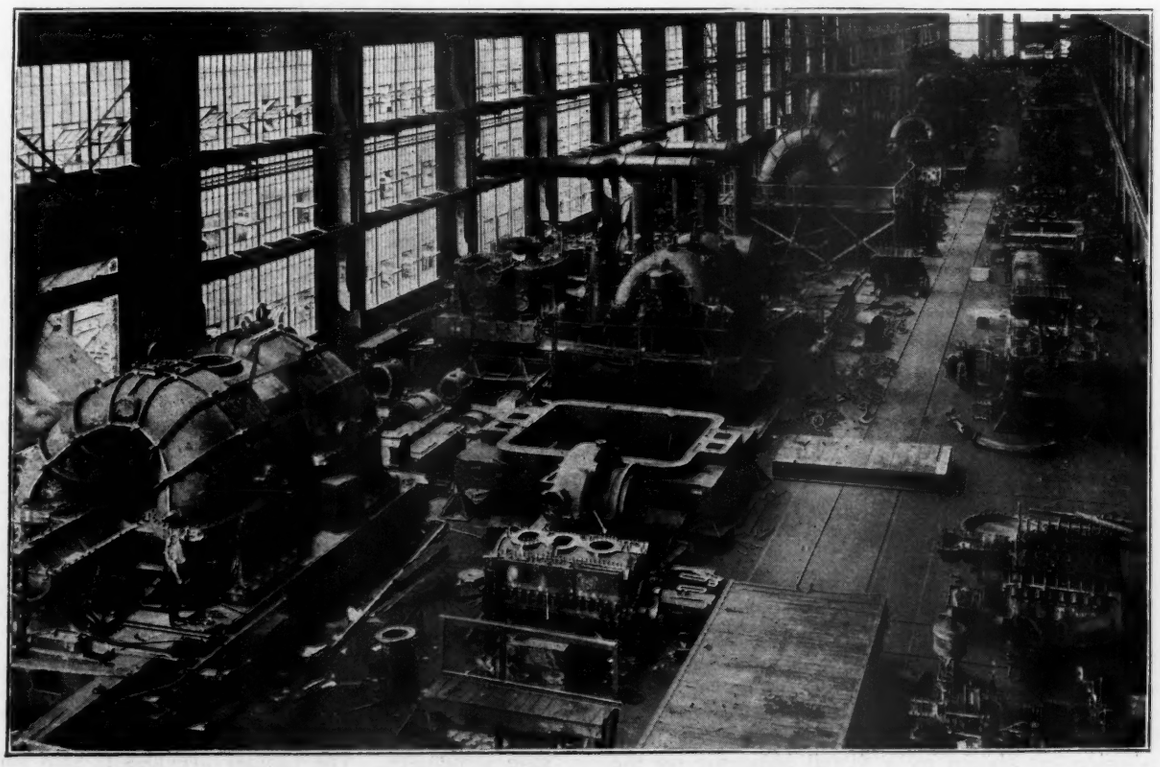
The accompanying illustration shows in a convincing manner the activity in one phase of the electrical industry—manufacture of large turbine units. The photograph from which the illustration was made was taken recently when there were units on the floor of the South Philadelphia works of the Westinghouse Electric & Manufacturing Co. aggregating a capacity of 164,000 kw. Nearly 150,000 kw. of this amount was made up of five turbines for some of the largest power companies in the United States. These large units include one 35,000-kw. turbine for the Hell Gate station of the United Electric Light & Power Co. of New York, one 25,000-kw. turbine generator for the Gold street station of the Brooklyn Edison Co., one 25,000-kw. turbine for the Virginia Power Co., Cabin Creek, Va., one 35,000-kw. turbine for the Calumet station of the Commonwealth Edison Co., Chicago, one 25,000-kw. turbine for the United Electric Light Co., Springfield, Mass., and one 10,000-kw. turbine for installation in the plant of the American Rolling Mills, Middletown, O.

NEW ENGLAND POWER CO. PLANNING AUTOMATIC STATION.

Generator Rated at 5000-Kv-a. to Be Driven by Water Power and Controlled by Automatic Operating Equipment.

The New England Power Co. is preparing to install an automatic control equipment for a hydroelectric generating station to be located at Searsburg, Vt., on the Deerfield river. The station will consist of one 5000-kv-a., 2300-volt, 3-phase, 60-cycle, water-wheel-driven generator with direct-connected exciter and automatic control, furnished by the General Electric Co., an I. P. Morris water-wheel, and a Woodward governor. The voltage will be stepped up to 72,000 volts through a bank of three 1667-kv-a. single-phase transformers, and the station will be tied in with the system of the New England Power Co., which is tied in with other systems and serves a large part of New England. The station will be located in an unsettled mountainous region and will be practically inaccessible during a great part of the winter. The retaining of properly trained and reliable operators under such conditions would prove difficult and expensive.

The automatic control will provide for starting and stopping the unit by means of a time switch. The governor will be given a fairly drooping



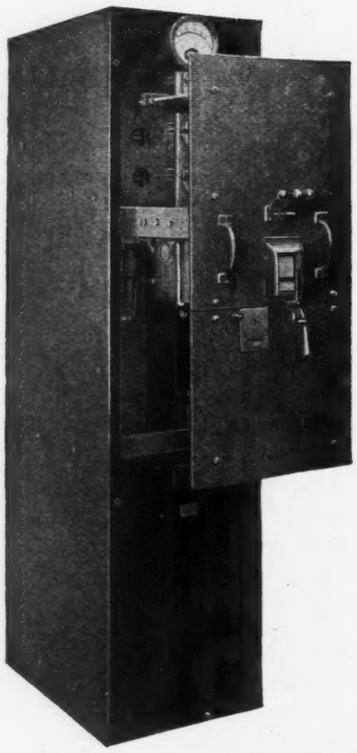
View of Testing and Assembly Floor of South Philadelphia Works, Showing Many Large Units Under Construction.

characteristic so that the unit will not only deliver approximately constant load, but will assist in regulating the system frequency. In case the water flow is less than that anticipated and provided for by an adjustment of the governor a float switch will shut down the station. While the station is a relatively small portion of the system capacity it will automatically feed into the system during the part of the day when most needed, but will not draw the pond level down to a point that will result in inefficient use of water.

DRAW-OUT OIL CIRCUIT-BREAKERS FOR SWITCHBOARDS.

Individual Units May Be Mounted Together to Control Any Desired Number of Different Circuits.

One of the late developments in switchboard apparatus made by the General Electric Co., Schenectady, N. Y., is the mounting of a Type FK-20 oil circuit-breaker in a safety inclosed unit



View Showing Circuit-Breaker Partly Withdrawn From Panel.

panel of the draw-out type. The combination is available in capacities up to 300 amperes for either wall or floor mounting. The housing consists of sheet-steel plates flanged and riveted so as to form a supporting and inclosing structure for the oil circuit-breaker and other devices. The oil circuit-breaker, bus disconnecting device, etc., are mounted on a carriage that may be pulled out, making all parts accessible and electrically dead. An interlock lever between the housing and the oil circuit-breaker prevents the panel from being drawn out unless the circuit-breaker is in the open position, as shown by a visual indicator on the front panel. The interlock also prevents the carriage from being pushed back into place when the circuit-breaker is in the closed position. The panel is placed in the operating position by pushing the interlock lever forward and at the same time rolling the carriage into place.

The panels for floor mounting, besides the circuit-breaker and disconnecting device, have a subcompartment below the circuit-breaker compartment suitable for the installation of instrument transformers and meters. The wall mounted panel has no such provision. The panels are simple and easy to install, as they can be mounted singly or in groups wherever convenient, and can be readily moved if desired. Busses are installed inside the housing near the top, utilizing the openings in the sides and omitting side cover plates between adjacent housings.

By mounting several of these units together it is possible to form a complete switchboard for the control of any number of circuits. The chief feature of this type of panel is the safety which it affords all persons working in its immediate vicinity. It is practically impossible to come in contact with live parts.

FIRE PREVENTION METHODS AND BUILDING CODES.

In every city of importance regulations are enforced or at least exist for the express purpose of insuring safety from fire. While legislation meant directly to safeguard human life is admittedly praiseworthy, the entire responsibility of legislators whether in city councils, or state or national bodies, is by no means discharged when they have required adequate openings, a maze of fire escapes, unobstructed streets and alleys, and a multitude of other things. Assuming that these things do reduce loss of life, or even if we could assume that they would prevent loss of life entirely, they still do not relieve the nation of its loss of wealth due to its annual bonfire.

Sentimentally, it is not as important to prevent loss of property as to prevent loss of life. The regrettable thing is, however, that these two often go hand in hand. If we were able to express the value of a life in dollars and cents, the crime of unnecessary fires would stand out startlingly by expressing the actual loss in dollars by so many human lives.

From all angles, the responsibility which legislators carry to safeguard life extends also to property. Every architect and engineer knows that it is possible to build structures which will be reasonably proof against destruction by fire. Legislation to secure fire safety is equally important with that aimed at elimination of unnecessary and expensive practice in both design and construction.

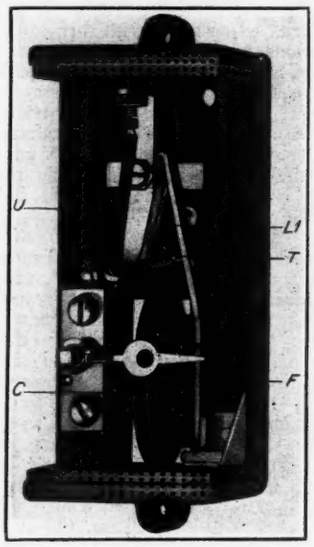
Very properly we think the department of commerce under the directorship of Herbert Hoover has created a building code committee which has for its object the standardization of building code regulations and the removal of those requirements which serve only to increase the cost of construction and add to confusion in practice. We respectfully suggest that this committee may properly consider standardization of building code regulations so as to produce inherently fire-safe structures. The annual fire loss is said to total approximately $500,000,000.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Application of Equipment and Methods in Practice

A Thermostat for Regulation of Heating Systems.

Unless properly regulated the best heating system may not provide comfort and healthy conditions for the occupants and therefore thermostatic control is often a profitable investment. Gold's thermostat, made by the Gold



Interior View of Gold's Thermostat No. 1066.

Car Heating & Lighting Co., 220 36th street, Brooklyn, N. Y., which was originally manufactured for controlling the temperature of railway cars, has proved so satisfactory that it has been installed on house and building heating systems. The existing piping usually need not be changed in any way to install the Gold system and the electric energy for its operation may be obtained from a lighting or other convenient circuit.

This thermostat is of the positive type, moving through its entire range instantly and causing a similar motion in the valve or damper from fully open to fully closed. The temperature sensitive element is the double diaphragm *C* containing a volatile liquid and constructed in two sections joined in the center and hermetically sealed. The front wall transmits its motion to the lever arm *F* which operates a switching mechanism opening or closing the electric circuit.

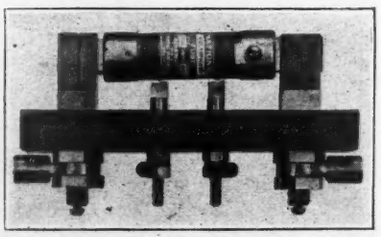
Now as long as the diaphragm is expanded by any temperature above the critical point from which the thermostat is set, the lever arm *L*-1 will remain in contact with *T*. When the temperature falls, allowing the diaphragm to contract gradually, the lever arm *L*-1 will continue to bear upon this contact until the continued recession of the diaphragm overcomes the tension of the spring *U*. When this occurs, the lever arm *L*-1 jumps away, thus breaking the contact by a quick and positive movement of over 3/8 in. Thus the thermostat performs the function of an ordinary single pole switch actuated by temperature changes.

The contact points are made of silver, while the thermostat is inclosed in a perforated sheet metal case, with the standard finish statuary bronze.

Multiphase Renewable Fuses for Motor Circuits.

Electrical manufacturers have been working to develop a means to prevent polyphase motors from running single phase in case one fuse should blow. Motor manufacturers have devoted most of their experiments to attempting to utilize a relay device in connection with the controlling apparatus, but inasmuch as the blowing of one fuse in a multiphase circuit does not operate the circuit breaker or overload release the motor continues to run single phase. The Federal Electric Co., Chicago, has developed a low-voltage auxiliary coil which is embodied in the renewable cartridge of "National" renewable fuses, and as the cartridge can go into the case in but one position, it easily makes the auxiliary connection with the fuse case itself.

Leads are brought out for connecting the inter-phase circuit in either delta or "Y." These leads are made with either wire connections attached to the case for front connecting or auxiliary knife-blade connections are attached for back connecting on panels, switchboards, etc. The "National" multiphase renewable fuse, as the new device is called, serves two purposes. First, as a fuse it is so constructed that it withstands the high starting current of motors, yet protects the running load within the limits prescribed by the Underwriters' Laboratories, Inc. It is powder-packed, which is said to represent the best known fuse practice. It has the metallic "tell-tale" indicator which shows in plain view upon the outside of the fuse the rated amperage of the element with which the



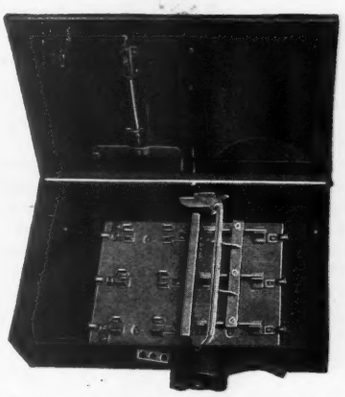
View Showing 100-Ampere, Back-Connected Multiphase Fuse.

fuse is loaded. As the fuse is made for operation on multiphase circuit it acts as a circuit-breaker; that is, when one fuse blows the auxiliary device makes one of the other elements in one of the other fuses blow, thereby breaking the circuit entirely and eliminating the possibility of the motor running on a single phase supply.

"National" multiphase renewable fuses are built on the correct time-limit principle, and after once installed do not need any attention whatsoever until they have operated, and then the interruption caused by renewing the fuse is very slight, according to the statement of the manufacturer.

Quick Make and Break Safety Starting Switches.

To withstand the most severe service in industrial plants, the Westinghouse Electric & Manufacturing Co., East



Westinghouse Type WK-55 Safety Starting Switches.

Pittsburgh, Pa., is manufacturing a switch of very rugged construction with quick make and quick break action. While such service usually demands only disconnecting switches, the capacity and arcing arrangements provided in the type WK-55 are sufficient to enable the switch to break the locked current of alternating-current motors having full load current rating equal to that of the switch.

The quick make and quick break mechanism which operates the switch blade is inclosed in an external cast-iron hub or housing integral with the operating handle. This complete mechanism can be removed and replaced without disturbing the inclosed switch in any manner.

Over the fuse compartment is provided a door. The door is so interlocked that it can be opened only when the switch is in the "off" position, at which time all accessible current carrying parts are dead. This door may also be locked so that only authorized persons have access to the fuses. An outer door, provided with means for sealing or padlocking opens over the whole front of the switch cabinet, making it possible to inspect the switch while in operation, or to make motor-load test connections without stopping the motor. A 3-hole bracket on the side of the cabinet permits the switch to be locked independently by three individuals. The switches are built for 250- and 600-volt service, both alternating current and direct current.

Functions of the Victor-Kearsley Stabilizer.

To aid radiologists in securing consistently good results with the Coolidge

Victor-Kearsley Stabilizer.

tube, the Victor X-Ray Corp. has recently placed a new device on the market, known as the Victor-Kearsley stabilizer. The function of this apparatus is to automatically regulate the volume of the rays so that poor results due to fluctuations in the power supply are eliminated.

The stabilizer controls the volume of the X-Rays by controlling the amount of current passing through the tube. It is connected in the high-tension circuit, in series with the tube current. Any fluctuation of this current causes the stabilizer to produce automatically a variation in the filament current sufficient to maintain the desired constant milli-amperage in the tube.

The main elements consist of a vibrating relay which holds the filament current constant, a limiting relay, a fixed resistance in each circuit, a hand adjusting operating mechanism, and a switch to connect it to, or take it off, the circuit.

The operation is simple. When the tube current fluctuates, the vibrating relay causes one of the resistances to be thrown in or out of the filament circuit, regulating the latter according to the desired current setting. The rapidity of the relay's action is so great that an average of filament current is secured that gives a constant reading on the milliampere meter which registers the tube current. The function of the limiting relay is to damp the heavy current that surges through the tube when the switch is closed. When the tube is running the relay does nothing.

The regulating mechanism is used to vary the strength of the vibrating relay's magnetic circuit, and allows a range of firom 2 to 100 milliamperes, as desired. It is actuated by a knurled fiber handle at the bottom of the stabilizer. The scale is not calibrated directly in milliamperes, but carries a set of arbitrary figures used to obtain duplicate settings for any given tube current.

An Improved Type of Trackless Trolley Car.

Tests on an improved new type of trackless trolley car or trollibus manufactured by the Trackless Transportation Co. of New York City, were recently completed at the General Electric Co.'s plant, Schenectady, N. Y., where the electrical equipment was installed. These new trollibuses will be placed in operation by the city of Detroit this fall and are said to incorporate a number of new features both in design and operation not found in trollibuses in use recently.

The bus demonstrated at Schenectady is an adaptation to electric drive of an ordinary gasoline motor bus, the driving motors and control being placed beneath the front hood which is retained. The sliding type collector is mounted on a U. S. standard trolley base supported on a special platform raised above the car, and carries a 14-ft. Shelby pole with collector for connection to the overhead.

The overhead line construction is of the same character used in previous buses equipped by the General Electric Co., except that the two wires are suspended on 18-in. centers. The main dimensions of the bus are: Length from spring horn to back of body, 25 ft.; wheel base 183 ins.; overall width, 88 ins.; weight, 11,740 lbs.

The chassis is of pressed steel frame with specially designed front axle and internal gear on rear axle. The propeller shaft is equipped with service brakes and there are external drum type brakes on the rear wheels for emergency. The driving mechanism consists of two 600-volt GE 258 railway motors connected in tandem driving the rear wheels through a differential gear and the usual universal joints. The bus speed will be about 23 mi. per hr. maximum.

The control is series parallel control with 2 motors consisting of eight electrically operated contactors and foot-operated master controller of the non-automatic type, which allows the operator to select the most suitable speeds for operation. This control gives four steps in series and three in parallel which is ample for starting easily without a hammer blow on the gearing or discomfort to passengers.

Overload protection is provided by two 600-volt cartridge fuses N. E. C. standard, experience with previous installations having proved that overload protection by means of circuit-breakers or live breakers as is customary with trolleys is unsuitable to the trackless vehicle. With the exception that the foot controller handles control current only the driving and controlling mechanism is generally the same as in the first GE installation.

The following is a resumé of the principal facts about the Trackless Trolley Transportation Co.'s vehicle, in addition to those already presented: Seating capacity, 29 passengers and driver; track of rear wheels, 71 ins.; track of front wheels, 66.5 ins.; size of front tires, 36 by 6; size of rear tires, 40 by 8; height from ground to roof, 8 ft. 2 ins.; height from ground to floor, 27 ins. light, 26.5 ins. loaded; inside width on seat line, 82 ins.; inside length on seat line, 20 ft. 5.5 ins.; inside height from floor to ceiling, 6 ft. 5 ins.; height from ground to step, 16 ins. (10-in. riser on step—one step and in); chassis interchangeable for gas or electric drive; lighting 6-volt storage battery charged by automobile type generator belted to driving motors; window posts, 29 ins.; width of seats, 33 ins.; lights, seven flush receptacles step light—destination light—tail light—two headlights; curtains, Standard Curtain Supply Co.; buzzer, Signal system standard, and fare box, standard.

New Type of Trackless Trolley Car Manufactured by Trackless Transportation Co.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Michigan State Telephone Co., Detroit, plans to expend $1,136,868 for additional telephone facilities.

American Mica Products Co., Chicago, recently moved its offices from 80 North Dearborn street to 177 North State street.

National District Telegraph Co., New York City, has leased property at 183 Varick street, for a new local establishment.

Connecticut Telephone & Electric Co., Meriden, Conn., will build a new 1-story wireless station near North Colony street.

Monarch Refillable Fuse Co., 147 Leslie street, Buffalo, N. Y., has filed notice of reduction in its capital stock from $500,000 to $100,000.

Columbia Telephone Co., Columbia, Mo., plans to expend $50,000 on plant improvements. The company will install cables, additional switchboards, etc.

Bowling Green Die & Tool Co., Bowling Green, O., plans to manufacture electric washing machines under patents obtained by R. L. Swartz, manager of the company.

K-W Electric Co., 49 Lawrence street, Newark, N. J., has been awarded a contract by the Board of Education for electrical work and equipment at the Monmouth street school.

Hi-Voltage Equipment Co., 3305 Croton avenue, Cleveland, has recently issued bulletin No. 2, which illustrates and describes its line of lightning arresters, choke coils and fuses.

Thomas A. Edison, Inc., West Orange, N. J., is taking on additional employes at its local electrical works, and during the past month about 350 workers have been added to the force.

McCarthy Brothers & Ford, 41 East Eagle street, Buffalo, N. Y., have been awarded the contract for electrical work, including equipment installation, at the new Statler hotel on a bid of $250,000.

Baker & Co., Inc., Newark, N. J., has issued the 14th edition of "Data Concerning Platinum," which contains new tables, illustrations, and matter descriptive of various appliances made of platinum.

Western Union Telegraph Co., Chicago, has leased the 3-story building and adjoining 1-story structure at 1029-35 West Adams street, for 20 yrs. at a total rental of $240,000, to be used as a service station.

Allis-Chalmers Manufacturing Co., Milwaukee, has issued bulletin No. 1118 entitled "Polyphase Induction Motors." The bulletin states that Allis-Chalmers type "AN" polyphase induction motors have been well and favorably known for many years in all drives of industrial application. In order, however, to take full advantage of improvements and advances made during recent years along various lines and benefit as far as possible by the experience gained over an extended period under all conditions of operation, the new line of type "AR" motors, presented in bulletin 1118, has been developed. These range in output from 0.05 hp. to 200 hp., and while in general covering the same ratings as the former type "AN" motors, they represent a new development throughout.

Southern Bell Telephone & Telegraph Co., Birmingham, Ala., is arranging a program of extensions and improvements in the state to cost about $3,000,000, the expenditure to be divided over a period of time.

Pattison Brothers, 1182 Broadway, New York City, electrical engineers, are preparing plans for the electrical installation at the new club house for the Scarsdale (N. Y.) Golf Club. Considerable equipment will be required.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has recently received from the Pacific Gas & Electric Co., an order for six high-tension oil circuit-breakers, to be used on a 220,000-volt solidly grounded system.

Topeka Steam Boiler Works, Topeka, Kan., plans to erect a plant at Second and Jefferson streets to provide larger offices, sales and warehouse space in which will be carried a complete line of power-plant equipment, etc.

Milwaukee Reliance Boiler Works, Hadley and 32nd streets, Milwaukee, illustrate and describe in their catalogue No. 20-F., the "Reliance" induction type feed water heater, purifier, filter and receiver. They state that this heater "is the culmination of over 20 yrs. of study and practical feed water heater manufacturing experience." On account of the danger involved, cast iron has been eliminated so far as possible but, where this metal must be used, the parts have been made extra heavy and rigidly reinforced. The ratings of the heater are said to be very liberal and an unequivocal guarantee that the machines will easily do the work for which they are intended is furnished by the manufacturers. The "Reliance" heater is made in 13 sizes from 150 to 3000-hp.

Cutler-Hammer Manufacturing Co., Milwaukee, manufacturer of electric controlling devices, has announced that Harry W. Eastwood, who for the past 4 yrs. has had charge of the steel mill and crane division of its Cleveland branch, has been made branch manager, taking the place of Lynn B. Timmerman, who leaves to enter the automobile business in Lima, O. Associated with Mr. Eastwood will be E. L. Windenburg as office manager. Mr. Windenburg takes the vacancy made by the sudden death of A. F. Loomis on Aug. 22. The Cleveland office and territory of the Cutler-Hammer Manufacturing Co. continues as a part of the central district comprising the Cleveland, Pittsburgh and Cincinnati offices and territory. A. G. Pierce, of Pittsburgh, is district manager and has associated with him in addition to Mr. Eastwood, R. I. Maujer as branch manager of the Cincinnati office, and J. S. Jones as branch manager of the Pittsburgh office.

Atlantic Electric Elevator Co., 329 South Broad street, Philadelphia, has been awarded a contract by the city of Philadelphia for the installation of 14 passenger elevators and one electric freight elevator at the City Hall building, at a price of $477,940.

Jewell Electrical Instrument Co., 1640 Walnut street, Chicago, of which Orval Simpson is president, has announced that owing to the increased demand for "Jewell" instruments, the company recently found it necessary to increase its capitalization to $150,000 and enlarge its organization. There has been no change in the management of the company, Orval and Ray Simpson retaining a substantial control of the stock. A small portion of stock was sold to a few of the company's executives, and A. F. Klink, president of the Bryant Zinc Co., Chicago, bought considerable and has been elected a director and also the treasurer of the Jewell Electrical Instrument Co. The company states that while production is not back to normal it is pleased to note that each month of the year has shown a conservative and continued increase in the volume and number of orders booked. The opinion is expressed that conditions are improving on a healthy and substantial basis.

Cleveland Crane & Engineering Co., Wickliffe, O., has recently issued an illustrated folder covering some of the main features of an electric tramrail conveying system. Actual installations of the system in shops and factories, including foundries, warehouses, rubber plants, coal handling plants, garages, paint shops, etc., are described and illustrated in detail. According to the booklet, this system is extremely flexible, and solves the shop-conveying problems in the handling of all materials up to 2 tons in weight. The system reaches into every corner of the plant, passes from room to room, from building to building, around posts, through doors, up inclines as much as 12.5 deg. slopes, and from floor to floor, the latter by the use of elevators. Briefly, the system consists of a combination of standardized rail, fittings and carriers, which have been developed to meet the demands for an inexpensive system of shop transportation. The system is described in detail and in addition part of the booklet is devoted to describing and illustrating carriers, both hand and electric; cranes and transfer bridges; attachments, and fittings. Suggestions for application of the system and directions for installing are also given.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

EDWARD FLAD has resigned as a member of the Missouri Public Service Commission and plans to return to St. Louis to follow his profession as a consulting engineer.

DONALD TREAT CANFIELD, an electrical engineer, formerly with the Jenckes Knitting Machine Co., Pawtucket, R. I., has been appointed instructor of electrical engineering at Purdue University, Lafayette, Ind. He is a graduate of the Worcester Polytechnic Institute, Worcester, Mass., class of '20.

M. M. WYCKOFF, formerly engineer, construction superintendent and general purchasing agent for the T. A. Gillespie Co., has announced the formation of the Wyckoff Engineering Corp., with offices at 233 Broadway, New York City, for the general practice of engineering, contracting, building; purchase, sales and efficiency engineering; reports, appraisals and investigations.

H. D. GAY, of Philadelphia, on behalf of the Electric Storage Battery Co., presented to each of the ladies attending the convention of the Association of Edison Illuminating Companies at Spring Lake Beach, N. J., Sept. 12-15, a very handsome and convenient week-end bag. This useful gift was greatly appreciated and the considerate donor was enthusiastically thanked.

ROBERT GORDON has been appointed stores manager of the telephone distributing house of the Western Electric Co. at New York City. He started as a clerk in the electrical department of the Gotham house more than 27 yrs. ago, and since 1901 he has been known at various times as storekeeper, supply department manager, assistant supply sales manager, supply stores manager and now stores manager of the New York telephone distributing house.

W. L. SIOUSSAT has been appointed stores manager of the supply distributing house of the Western Electric Co. at New York City. He started in the Chicago telephone department nearly 14 yrs. ago and early in 1911 he was appointed chief storekeeper at Detroit, but after 6 mo. he went to Chicago for 3 yrs. While there he was head of the service department and later assistant stores manager. He left Chicago in 1914 to become stores manager at Cincinnati and later at Cleveland.

MATTHEW S. SLOAN, president of the Brooklyn Edison Co., Inc., Brooklyn, N. Y., who was elected president of the Association of Edison Illuminating Companies at the recent annual meeting of that organization, started his career as a practical power machinery man. After graduating from the Alabama Polytechnic Institute at Auburn, Ala., he took the apprenticeship course at the Schenectady (N. Y.) works of the General Electric Co., and for 2 yrs. was on the road as turbine construction engineer for the General Electric Co. Mr. Sloan's further progress in the electrical industry was outlined on p. 475 of the Sept. 24, 1921, issue of ELECTRICAL REVIEW.

K. G. RENNIE, treasurer of the Hub Electric Co., 2225 West Grand avenue, Chicago, began his connection with the electrical industry with the B. R. Electric Co. in 1907. He was in charge

K. G. Rennie.

of the company's illumination work and lamp business, resigning from that position in 1917 to become affiliated with the Brilliant Electric Division of the General Electric Co. at Cleveland. Since February of this year he has been connected with the Hub Electric Co. and the Chicago Electric Sign Co., being recently elected treasurer of the former and secretary of the latter company. Mr. Rennie has done a great deal of illuminating work all over the country, being among the first to make a specialty of surgical, optical, dental and therapeutic lamps. He has also made a study of scientific illumination from every angle. Mr. Rennie is a member of the Illuminating Engineering Society and the Electric Club of Chicago.

EDWARD C. SCHMIDT, formerly professor of railway engineering at the University of Illinois, a major in the ordnance department of the U. S. Army during the world war, more recently a mechanical engineer with the North American Co., St. Louis, and in the last few months engaged in mechanical engineering work in Milwaukee, has been recalled to the University of Illinois to again become head of the department of railway engineering. Mr. Schmidt resigned his position at the University of Illinois in 1919, although he had been in the ordnance department of the army since August 11, 1917, when he was commissioned a major. He is now entering his third period of service with the University of Illinois. He was instructor in machine design and later professor of railway engineering and experimental engineering from 1898 to 1903. From 1906 to 1919 he was professor of railway engineering and in charge of test car and locomotive test car work. Previous to his first appointment he served the C. W. Hunt Co., the Kalbfleish Chemical Co., the Edison Electric Illuminating Co. of Brooklyn, and the American Stoker Co. of New York City in various engineering capacities. From 1903 to 1904 he was assistant engineer for the American Hoist & Derrick Co. of St. Paul and from 1904 to 1906 engineer of tests for the Kerr Turbine Co., Wellsville, N. Y.

F. W. PRICE, who for several years has been associated with the Apex Electrical Distributing Co. of Cleveland as southern district manager, has been promoted to the rank of eastern district manager, taking in the territory of metropolitan New York, eastern Pennsylvania, New Jersey, Maryland, West Virginia and Virginia. R. H. Short, who has been associated with Mr. Price as assistant southern district manager, is now in charge of the entire southern district.

OBITUARY.

THERON MCCREADY, night engineer of the Public Service Co. of Northern Illinois at Barrington, Ill., was killed Sept. 24 when a bolt of lightning followed by an explosion destroyed the company's substation.

DOUGLAS D. BRONSON died at his home, 4840 St. Lawrence avenue, Chicago, Sept. 23, aged 61 yrs. He had been connected with the Commonwealth Edison Co. for 35 yrs., and at the time of his death held the position of superintendent of shops.

M. S. WRIGHT, president and general manager of the Pneuvac Co., Worcester, Mass., manufacturer of vacuum cleaners, died Sept. 5. He was born in Janesville, Wis., in 1859, and when 19 yrs. of age went to Worcester, where he had resided practically up to the time of his death. Launched on his business course before the days of electrical appliances, Mr. Wright's first efforts were directed toward the development and manufacture of piano and organ actions. He stayed in that business for more than 20 yrs., working on pneumatic actions for player-pianos, and developing the vacuum principle for playing rolls. In 1907 Mr. Wright turned his attention to the vacuum cleaning field and in 1908 began the manufacture of vacuum cleaners, devoting his time to developing and improving the working parts of the well known electric "Sweeper-Vac." It is stated that the affairs of the M. S. Wright Co., for which the Pneuvac Co. is the selling agent, will be carried on by the present organization, which includes the four sons of Mr. Wright, all of whom have been closely identified with the business since its inception.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Rutland, Vt.—Vermont Hydroelectric Corp. has completed the installing of a new generator and auxiliary operating equipment at its Mendon power plant.

Boston, Mass.—The Institutions Department of the city, Thomas O'Brien, commissioner, will build a pumping plant for waterworks service in the Long Island District, Boston Harbor. The Department is located at Room No. 209, City Hall Annex.

Boston, Mass.—The Edison Electric Illuminating Co. is arranging for an increase in its capital stock, the proceeds to be used for general financing, extensions, operations, etc.

Haverhill, Mass.—Considerable electrical equipment will be installed in the brick manufacturing plant to be erected by the Bay State Brick & Stone Co., including motors, industrial electrical apparatus, etc.

New Bedford, Mass.—Fire Sept. 8 destroyed a portion of the power department at the plant of the New Bedford Cordage Co., Ash and Court streets. The department will be rebuilt.

Waterbury, Conn.—Plume & Atwood Co. has filed plans for the erection of an electrical building at its mechanical works, to be used for transformer service.

Woonsocket, R. I.—Considerable electrical equipment will be installed in the 6-story mill to be erected by the Lafayette Worsted Co., estimated to cost $150,000. Foundation work is under way.

Binghamton, N. Y.—Binghamton Light, Heat & Power Co. will soon commence the construction of a transmission line from Endicott to Marathon, passing through Maine and Whitney Point, for light and power service in this district.

Buffalo, N. Y.—Niagara & Erie Power Co. has filed notice of increase in capital from $300,000 to $900,000, for proposed expansion in plants and system.

Flushing, L. I., N. Y.—Queens Electric Light & Power Co., Bridge Plaza, Long Island City, has awarded a contract to Post & McCord, 101 Park avenue, New York City, for the erection of a 4-story building, 75 by 100 ft., on Amity street, Flushing, estimated to cost $200,000.

New York, N. Y.—Considerable electrical and mechanical equipment will be installed in the new two-story ice manufacturing plant to be erected by the Fulton Ice Co., Inc., 18 East 41st street, at 138-40 Cherry street, estimated to cost $100,000.

New York, N. Y.—Considerable electrical equipment will be installed in the 2-story mechanical laundry to be erected by the Pioneer Wet Wash Laundry, Inc., 514 West 46th street, at 434-36 West 41st street, estimated to cost $45,000.

New York, N. Y.—The Elks Club, 108-16 West 43d street, has discontinued the operation of its private electric plant and has awarded a contract for light and power service to the New York Edison Co., including power for pumps, refrigeration plant, etc.

New York, N. Y.—Considerable electrical equipment will be installed in the 12-story building to be erected by the Dodge Sales & Engineering Co., at 49 Park place, estimated to cost about $1,000,000. It will be known as the Power and Transmission building.

Niagara Falls, N. Y.—Niagara Falls Felt & Paper Co., a subsidiary of the Niagara Falls Power Co., Canal Basin, will install considerable electrical equipment in its proposed plant on Sugar street, estimated to cost $300,000.

Sanborn, N. Y.—The Cambria Power Co. has been granted permission by the Public Service Commission to build an electric power plant at Cambria, with line extensions to Lewiston.

Syracuse, N. Y.—Syracuse Lighting Co., a subsidiary of the United Gas Improvement Co, Philadelphia, has filed notice of increase in capital from $4,000,000 to $5,000,000, for extensions, betterments, etc.

Wayneport, N. Y.—New York Central Railroad Co., Grand Central Terminal, New York City, will build a new coaling plant on a local site.

Dover, N. J.—New Jersey Power & Light Co. is completing the construction of a power line to the municipal electric pumping plant of the city for increased service. The company is also increasing its electrical service at the Beech Glen mines of the North Jersey Steel Co.

Montclair, N. J.—The Chamber of Commerce is negotiating with the Town Commissioners for the installation of a new street-lighting system on Bloomfield avenue, to form a "white way" thoroughfare.

Newark, N. J.—Public Service Railway Co., Terminal building, has arranged for an issue of $1,540,000 in equipment trust certificates, for extensions, betterments, new electrical equipment, etc.

Newark, N. J.—Considerable electrical equipment will be installed in the refrigerating plant to be constructed by the Board of Freeholders at the Essex Mountain Sanatorium, Verona. Bonds for $60,000 for the installation have been approved.

Apollo, Pa.—Considerable electrical equipment will be installed in the 1-story plant to be constructed by the Sanitary Collapsible Barrel Co., on North Fourth street.

Ardmore, Pa.—Counties Gas & Electric Co. has filed notice of a stock issue of $6,120,000 with the Public Service Commission, for general financing and operations, extensions, improvements, etc.

Bellevue, Pa.—Considerable electrical equipment will be installed in the garbage disposal plant to be constructed by the City Council, estimated to cost $35,000.

Bradford, Pa.—Bradford Electric Co. has arranged for a bond issue of $50,400, for general extensions, betterments, operation, etc.

Harrisburg, Pa.—Harrisburg Railways Co. is planning the early construction of a center pole line in Third and Walnut streets.

Harrisburg, Pa.—The City Commission is considering the installation of a new street-lighting system on North Second street, from Walnut to North street. The North Second Street Business Association is negotiating with City Commissioner Samuel F. Hassler, in charge, for the improvement.

Hollidaysburg, Pa. — Considerable electrical equipment will be installed in the proposed cold storage plant to be built by the Blair Ice & Storage Co., recently organized with a capital of $100,000. G. B. Miller, 1112 Allegheny avenue, is president.

Philadelphia, Pa.—The Quartermaster Department of the Government, Intermediate Depot, will build a power house at its local property.

Pittsburgh, Pa.—Duquesne Light Co. has received a 5-year lighting contract from the Township Committee of Mount Lebanon Township, lighting the streets and highways. A new substation will be built for the service.

Pittsburgh, Pa.—West Penn Power Co. has arranged for a bond issue of $3,022,000, the proceeds to be used for general operations, extensions, improvements, etc.

Pittsburgh, Pa.—Beaver County Light Co. has filed notice of a bond issue, $130,000, for extensions and betterments, etc.

Raymilton, Pa.—National Transit Co. is planning the rebuilding of its pumping plant, recently destroyed by fire.

Reading, Pa.—Metropolitan Edison Co. has arranged for a bond issue of $50,000, for general operations.

Sayre, Pa.—Sayre Electric Co. is arranging a bond issue of $311,000, the proceeds to be used for extensions, operations, etc.

Scranton, Pa.—Warren Light & Power Co. has arranged for a bond issue of $212,000, and stock issue of $30,-

000, the proceeds to be used for general operations, plant extensions, etc.

Sunbury, Pa.—Considerable electrical equipment will be installed in the 2-story baking plant to be erected by the Butter Krust Baking Co., at 249 Eckman avenue, estimated to cost $150,000.

Weatherly, Pa.—Lehigh Valley Railroad Co. is planning the installation of electrically operated machinery and equipment at its local frog shops, to replace steam-driven apparatus.

Baltimore, Md.—Western Maryland Railroad Co. will commence the installation of electrical equipment at its new grain elevator in the Port Covington district at an early date. The structure will cost about $1,000,000.

Baltimore, Md. — Susquehanna Transmission Co. has filed plans for the erection of two plant buildings on Philadelphia road.

Gilpin's Falls, Md.—Gilpin's Falls Hydroelectric Co. has made application to the Public Service Commission to issue bonds, the proceeds to be used for general operations, extensions, improvements, etc.

North East, Md.—J. W. Archer & Son, operating a local canning plant, is planning the installation of a new power equipment at its power house, replacing equipment recently destroyed by fire.

Graham, Va.—Princeton Power Co. has filed notice of increase in capital from $100,000 to $200,000 for general expansion.

Marion, Va.—The Board of Directors, Southwestern State Hospital, has plans under way for the erection of a power plant at the institution. Eubank & Caldwell, Express building, Roanoke, Va., are architects and engineers.

Buckhannon, W. Va.—Buckhannon Light & Water Co. has construction under way on its 1-story power house. Leo Hudson, Wabash building, Pittsburgh, is engineer.

Morgantown, W. Va.—Hess Coal & Coke Co. will build a tipple at its plant and install new electric and mechanical equipment for other departments.

Petersburg, W. Va.—Community Power Co. will hold in abeyance its proposed new dam and hydroelectric development on the south branch of the Potomac river in Grant county, and has withdrawn its recent application to the Federal Power Commission for permission for the work.

Gastonia, N. C.—The Common Council is perfecting plans for a bond issue to total $500,000 for extensions in the electric light and waterworks systems.

Morganton, N. C.—The city will issue $25,000 light and water bonds. Address W. J. Hallyburton, city clerk.

Pilot Mountain, N. C.—It is planned to vote bonds for the construction of a power plant. Address the mayor.

Raleigh, N. C.—Owing to low water conditions the Carolina Light & Power Co. has discontinued power service to a number of industrial consumers, including 58 cotton mills and other plants. The curtailment will be effective the first three working days of each week until the water situation improves.

Barnwell, S. C.—The Common Council has awarded a contract to the Concrete Construction Co., Columbia, S. C., for extensions in the local street-lighting system.

Marion, S. C.—An election will be held to vote on the question of issuing $100,000 in bonds for installing a lighting system, extending sewers and improving the streets. Address the mayor.

Tallahassee, Fla.—Engineer Guy Winthrop is in charge of a survey planned to erect a dam across the Ocklocknee river at Stewart's bridge for the purpose of installing a hydroelectric power plant. If the plant is erected it will benefit the towns of Tallahassee, Quincy, Havana, Fla., and other communities.

NORTH CENTRAL STATES.

Eaton, O.—Authority has been granted the Liberty Light & Power Co. to build and operate electric transmission lines in Campbellstown and in Jackson and Jefferson townships.

Marietta, O.—Plans are being prepared by City Engineer G. H. Gampers, 220 New First National Bank building, Columbus, O., for the erection of a hydroelectric plant to be owned by the city.

Middletown, O.—All legislation in connection with the proposed ornamental boulevard lighting system on East Third street, from Water street to the Miami and Erie canal, has been disposed of by the City Commission, and City Clerk Kunz will advertise for bids shortly.

Petoskey, Mich.—A plan for enlarging and improving the city lighting plant is expected to be undertaken in the near future, the plant now being loaded about to capacity. Address the mayor.

Watervliet, Mich.—New equipment will be purchased for the municipal water system. A centrifugal pump driven by a 40-hp. electric motor will be installed. Address the mayor.

Chrisney, Ind.—Citizens Light & Power Co. has been incorporated with a capital of $7500 to furnish electricity for light, heating and power purposes. The directors are J. F. Bergman, L. E. Bays and others.

Kingman, Ind.—It is planned to erect a lighting plant here at an estimated cost of $18,582. Address J. M. Lewis, treasurer.

Barrington, Ill.—The power plant of the Public Service Co. of Northern Illinois was destroyed Sept. 24 by a bolt of lightning which was followed by an explosion. Address general offices, 72 West Adams street, Chicago.

Centralia, Ill.—The specifications for the "white way" call for a rubber insulated system, the stands to be of cast iron, with one large lamp. The cost is estimated at $39,533.55. Address the mayor.

Chillicothe, Ill.—A fund of $4000 has been secured for an ornamental lighting system. Address M. C. Kelly, chairman of Light Commission.

Lincoln, Ill.—Atlanta Electric Light Co. has contracted to purchase its power from the plant of the Lincoln Water & Light Co., and a transmission line 13 mi. long from here to Atlanta is to be built as soon as material can be obtained.

Sherrard, Ill.—Sherrard Electric Co. will construct an electric transmission line to serve the town of Reynolds and adjacent territory.

Madison, Wis.—The City Council has ordered lamps to be installed in various streets of the city. Address O. S. Norsman, city clerk.

Nekoosa, Wis.—At a recent meeting of the village board it was decided to extend the lighting system on River road. Address village clerk.

Oshkosh, Wis.—A canvass is being made for the installation of a system of special ornamental lamps. If the plan meets with favor work will be started this fall. The estimated cost of the project is between $30,000 and $40,000. Address the mayor.

Wabasha, Minn.—Bids were received Sept. 27 for the construction of a "white way" to light six blocks of the business section. Address J. M. Schouweiler, city recorder.

Winona, Minn.—The City Council has accepted a contract of the Wisconsin Railway, Light & Power Co. to replace the gas lamps now in use with electric lamps. Address the mayor.

Cedar Rapids, Ia.—The city plans to install lamps on various streets and thoroughfares of the municipality. Address E. L. J. Story, city clerk.

Oskaloosa, Ia.—A survey has been made and the reports are favorable to the project of constructing a dam to develop 4000 hp. for electric transmission line and operation of waterworks, the plant to be municipally-owned and operated. Address Congressman C. W. Ramsey.

Kansas City, Mo.—Ordinances providing for three "white ways" were passed in the lower house of the council, which provide for 600-watt lamps. Address the mayor.

Kansas City, Mo.—Kansas City Power & Light Co. has awarded a contract to the Fogel Construction Co., Reliance building, for the erection of its proposed substation, 60 by 90 ft. A. E. Beltis is engineer.

Liberty, Mo.—City Engineer Barnes states that the waterworks pumps are worn out and recommends the installation of electric pumps.

Salisbury, Mo.—Considerable electric equipment will be installed in the addition to be erected by the Salisbury Ice Co. to its ice-manufacturing plant, estimated to cost $75,000.

Hays, Kans.—The city has sold a bond issue of $19,000 for the purpose of improving the municipally-owned electric light plant. Address the mayor.

Neodesha, Kan.—An election will be held Oct. 11 to issue $195,000 in bonds for the improvement and extension of the municipal light and water systems. These would include the installation of oil burners in the power plants. Address the mayor.

North Platte, Neb.—Brady and Maxwell on the east and Hershey,

Sutherland and Paxton on the west have each voted bonds to build jointly a power line from North Platte to the respective villages for the purpose of obtaining electricity. Address the mayor, North Platte, Neb.

Wisner, Neb.—Bonds to the amount of $35,000 have been voted for the purpose of installing a municipal electric light and power plant. It is the intention to purchase the old plant and install new engines. Address the mayor.

Fairfax, S. D.—It is planned to run an electric power and light line from Valentine to connect all towns in the Rosebud territory. Address city clerk

Faulkton, S. D.—Bonds have been voted to install a lighting plant. Address the mayor.

SOUTH CENTRAL STATES.

Cornishville, Ky.—Bishop Wash and associates are organizing a new company to establish and operate a local electric light and power plant.

Kentenia, Ky.—Banner Fork Coal Co. is planning the construction of a power house at its property, and will also install considerable electrical mining apparatus for operations.

Nebo, Ky.—Nebo Light Co. has been incorporated with a capital of $3000 by J. M. O'Bryan, L. J. Morrow, T. H. Smith and others, to furnish light and power for dwellings, stores, etc.

Knoxville, Tenn. — Considerable electrical equipment will be installed in the fertilizer manufacturing plant to be erected by the Knoxville Fertilizer Co., at Vestal, near Knoxville, estimated to cost $350,000. James W. Dean is secretary and treasurer.

Fort Payne, Ala.—Fort Payne Light & Power Co. is planning the erection of a power plant with distributing system to serve coal-mining companies in this section. A. A. Miller is head.

Abbeville, La.—The Common Council has commissioned Harry A. Mentz, Magnolia, Miss., consulting engineer, to prepare plans for the construction of a municipal electric power plant and distributing system, with street lightning system, estimated to cost $100,000. R. P. LeBlanc is mayor.

New Orleans, La.—Harry K. Johnson, 1003 Hibernia building, and associates are planning the erection of a power plant with initial capacity of about 900 hp., estimated to cost $200,000.

Plain Dealing, La.—Plain Dealing Light & Power Co. is planning the construction of a power plant. M. S. Bolinger is president.

Gravette, Ark.—If the town will supply a site H. D. Jenkins, owner of the Eureka Springs and Harrison lighting plants, and R. A. Wilson of Harrison will erect a large powerhouse, ice and cold storage plant here to supply light and power for all towns along the west side of Benton county.

Lepanto, Ark.—The Town Council is planning the installation of a municipal electric power plant, in connection with other municipal work, estimated to cost $100,000.

Clinton, Okla.—The Common Council is planning enlargements in the municipal power plant and waterworks system to cost about $41,000.

Woodward, Okla.—The City Council has plans in preparation for extensions and improvements in the municipal power plant. Black & Veatch, Mutual building, Kansas City, Mo., are engineers.

Dickinson, Tex.—The Common Council has preliminary plans under way for the installation of a new electric-lighting system.

El Paso, Tex.—El Paso Electric Co. has arranged for a note issue of $750,000, the proceeds to be used for extensions and improvements in plants and system, general operations, etc.

WESTERN STATES.

Albuquerque, N. M.—Santa Fe Railroad Co. has awarded a contract to E. F. Ware, El Paso, Tex., for the erection of a power plant on a local site, estimated to cost $150,000.

Malad, Ida.—The Public Utilities Commission has ordered that the Evans Light Co. of Malad purchase more transformers and that larger conductors be installed.

Sacramento, Cal.—Bids were received Sept. 29 for furnishing electric energy for power and lighting for the filtration plant pumping station, expected to be placed in service by the city Jan. 1, 1922. Address M. J. Desmond, city clerk.

PROPOSALS.

Brownsville, Tex.—Bids will be received Oct. 20 for the supplying of one 500 to 700-kw. turbogenerator to be installed in the city electric plant. Address City Manager George Grupe.

Crowley, La.—Bids will be received Oct. 17 for the construction of a power plant. The specifications include engine and switchboard. Address J. O. Harpin, city manager.

Lebanon, Ind.—Bids will be received Oct. 10 for the installation of a new electric light plant in the Central grade and high-school building in Perry township. Address Adolphus Smith, trustee, R. F. D., Lebanon, Ind.

Rushville, Ind.—Bids will be received Oct. 3 for the construction of a 1-pole electric line from the east corporation line of the city to the county infirmary, and for the wiring of the county infirmary for electricity. Address county clerk.

Washington, D. C.—Bids will be received Oct. 3 for the installation complete of an electric passenger elevator in Unit C. U. S. Public Health Service Hospital No. 32, at Washington, D. C., in accordance with the drawing and specification, copies of which may be had at the Supervising Architect's office. Address James A. Wetmore, acting supervising architect, Washington, D. C.

Washington, D. C.—Bids will be received Oct. 12 for the installation of a lighting plant, wiring, etc., at the U. S. Quarantine Station, Port Townsend, Wash., in accordance with the drawing and specification, copies of which may be had at the office of the custodian at Quarantine Station, Port Townsend, Wash., or at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

INCORPORATIONS.

Boston, Mass.—Radio Time Service Co. Capital, $32,000. To manufacture radio apparatus. Charles B. Stretch is president, and Oliver L. Badger, treasurer.

New York, N. Y.—Cynosure Electric Advertising Corp. Capital, $12,000. To manufacture outdoor electric displays. Incorporators: E. and J. Rojo and S. S. Goldberg, 350 Broadway.

Brooklyn, N. Y.—Brooklyn Battery Shop, Inc. Capital, $20,000. To manufacture and deal in electric batteries and other electrical equipment. Incorporators: D. Stoller, F. Ehrler and E. J. Gould, 291 Broadway, New York City.

New York, N. Y.—Farad Electric Co. Capital, $15,000. To manufacture electrical specialties. Incorporators: F. Richold, F. Landau and W. Athenas. The company is represented by Barbieri & Zerilli, 313 West 42d street.

Orange, N. J.—Titan Miniature Lamp Co. Capital, $100,000. To manufacture electric lamps. Incorporators: George Anderson, A. E. Jackson and D. G. Littell, Bloomfield, N. J.

Jersey City, N. J.—Monarch Manufacturing Co. Capital, $50,000. To manufacture pumps, pumping machinery, etc. Incorporators: Joseph P. Montague, H. B. Watson and Frederick C. Henn, 665 Newark avenue.

Pittsburgh, Pa.—Moorhead Electric Machinery Co. is being organized by William L. and I. R. Moorhead and M. R. Mueller, to manufacture electrical equipment. H. J. Rectenwald, 1308 Farmers' Bank building, is representative. Application for a state charter will be made at an early date.

Orange, N. J.—Titan Miniature Lamp Co. Capital, $100,000. To manufacture electric lamps and kindred products. Incorporators: George Anderson, Dexter G. Dittell and Alfred J. Grosso, 308 Main street.

Chester, Pa.—Electrical Merchandising Co. Capital, $100,000. To manufacture electrical specialties. Incorporators: N. V. Reddington, John J. Reddington and George Shober. Chester L. P. Moore, 811 Shipley street, Wilmington, Del., represents the company.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Goods (58)—A merchant in Chile desires to purchase electrical goods and motors, electric lamps and supplies and parts, and electric light bulbs of 220 and 110 volts. Quotations should be given c. i. f. Talcahuano. Correspondence should be in Spanish. References.

Refrigerating Machinery (69)—An agency is desired by a mercantile company in France for the sale of refrigerating machinery. Quotations should be given c. i. f. French port. Correspondence should be in French. Reference.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Offering of Toledo Edison Co. First Mortgage Gold Bonds.

The National City Co., 137 South LaSalle street, Chicago, and National City Bank building, New York City, is offering a new issue of $13,500,000 Toledo Edison Co. first mortgage gold bonds 7% series due 1941, at a price of 96.5% and accrued interest, yielding over 7.33%.

The Toledo Edison Co. does the entire commercial electric light and power business in Toledo, O., and certain suburbs, and serves directly a population in excess of 260,000. It also supplies electric power at wholesale to companies serving other neighboring communities, the total population thus served directly and indirectly being estimated to exceed 310,000. In addition, the company does the artificial gas distributing business and a hot water heating business in Toledo. It is stated that the net earnings are over 2.2 times the annual interest charges.

Boston Utility to Issue Additional Capital Stock.

The Edison Electric Illuminating Co. of Boston has applied to Department of Public Utilities for authority to issue 45,056 shares of additional capital stock at a price to be determined by directors.

Report on Operations of U. S. Light & Heat Corp.

In a letter to shareholders accompanying the report for the year ended Dec. 31, 1920, C. O. Mininger, president of the U. S. Light & Heat Corp., says in part: "The management of the business passed into the hands of the present officers Feb. 7, 1921. During the 5 mo. preceding this date the company operated at a loss of $296,831, or an average of approximately $60,000 a month. The first attention of the present management was given to correcting the conditions that had created these losses, and there was immediately inaugurated a readjustment of salaries and an elimination of operating expenses wherever possible, and reductions totaling approximately $40,000 a month were made in overhead operating expenses in the executive and manufacturing departments. Immediate attention was given to the securing of additional business, and March showed a resulting profit of $3187, April $6116, May $22,816, and June $35,847. A considerable part of the profit shown for June, however, resulted from the price at which bonds secured by first mortgage on the company's property were retired.

"As an indication of what has been accomplished it may be stated that in May, 1920, sales of $577,957 resulted in a loss of $10,644, whereas in May, 1921, sales of $346,787 resulted in a profit of $22,816. Every endeavor is being made both in stimulation of sales and the introduction of economies to continue the operation of the company at a profit each month even under present business conditions. While, of course, the volume of business that will be received for the next few months cannot be predicted with certainty, it has been demonstrated that any return to normal times will result in substantial profit. The conditions resulting from the radical change in operation expenses above set forth have placed the finances of the company where it is assured of continuing to operate without concern as to its finances. It is confidently expected that the next report will show even greater improvement."

Havana Electric Railway, Light & Power Co.

	1921.	1920.
July gross	$1,005,423	$ 999,344
Net after taxes	435,849	452,377
Total income	442,660	462,619
Surplus after charges	157,067	216,938
7 mo. gross	7,409,439	6,557,285
Net after taxes	3,251,901	3,263,357
Total income	3,315,317	3,329,767
Surplus after charges	1,399,095	1,625,199

Bankers Buy Northern States Power Co. Bonds.

The Northern States Power Co. has sold $1,500,000 first and refunding mortgage 6% gold bonds to the Harris Trust and Savings Bank, the Guaranty Company, Bonbright & Company and H. M. Byllesby & Co. The bonds are a new block of the company's issue due April 1, 1941, and are being offered at 92 and interest yielding about 6.75%. Proceeds are to provide funds for construction and betterments to the properties.

Southwestern Power & Light Co.'s Subsidiary.

	1921.	1920.
July gross	$ 760,870	$ 731,865
Net earnings	322,817	202,629
12 mo. gross	10,201,240	7,697,756
Net earnings	3,849,600	3,041,040

American Power & Light Co.

	1921.	1920.
July—		
Gross	$ 1,846,883	$ 1,640,003
Net earnings	657,922	459,005
For year ending July 31—		
Gross earnings	24,476,558	18,913,917
Net earnings	8,200,787	6,998,222

Western Union Telegraph Co.

July operating income $785,939, compared with $1,345,464 for the same period in 1920. Seven months' operating income $7,017,082, against $10,152,804 for 1920 in the same period.

Consolidated Gas, Electric Light & Power Co. of Baltimore.

The Consolidated Gas, Electric Light & Power Co. of Baltimore, for the 12 mo. ended August 31, 1921, reports net income, after charges and taxes, but before depreciation, of $2,297,760. Income and operating expense statement, for the 12 mos. ended August 31, 1921, shows as follows:

Gross earnings	$16,176,648
Operating expenses and taxes	11,122,823
Net earnings	5,053,825
Fixed charges	2,756,065
Net income	2,297,760

Union Electric Light & Power Co. to Issue Preferred Stock.

The Public Service Commission has authorized the Union Electric Light & Power Co. of St. Louis to issue $1,000,000 of 7% preferred stock, the proceeds of which are to be used to reimburse its treasury for expenditures and betterments. The commission's order specified that stock must be sold before Dec. 31, 1922.

Cities Service Co.

The Cities Service Co. for August and the 12 mo. ending August 31, 1921, reports earnings as follows:

	1921.	1920.
August gross	$ 731,040	$2,014,224
Net after taxes	685,698	1,957,876
Surplus after charges	474,652	1,801,888
12 mo. gross	17,219,881	23,205,745
Net earnings	16,606,200	22,509,066
Surplus after charges	14,530,698	20,584,202

General Gas & Electric Subsidiary Companies.

	1921.	1920.
July gross	$ 897,333	$ 910,336
Net after taxes	226,870	113,950

Dividends.

	Term.	Rate.	Payable.	
Ala. Pr. & Lt., pfd.	Q	1.75%	Oct.	1
Consumers Pr., 6% pfd.	Q	1.5%	Oct.	1
Consumers Pr., 7% pfd.	Q	1.75%	Oct.	1
Detroit Edison	Q	2%	Oct.	15
Duquesne Light, pfd.	Q	1.75%	Nov.	1
East. Tex. El.	Q	$2	Oct.	1
Elmira Wtr., Lt. & R. R., 1st pfd.	Q	1.75%	Sept.	30
Elmira Wtr., Lt., and R. R., 2nd pfd.	Q	1.75%	Sept.	30
Kan. Gas & El., pfd.	Q	1.75%	Oct.	1
Louis. G. & El., pfd.	Q	1.75%	Oct.	15
Miss. Pr., pfd.	Q	$1.50	Oct.	1
Ottawa Lt., Ht. & Pr.	Q	1.5%	Oct.	1
Panama Pr. & Lt., pfd.	Q	1.75%	Oct.	1
Penn. Pr. & Lt., pfd.	Q	$1.75	Oct.	1
Pub. Serv. of N. J.	Q	1%	Sept.	30
Shawinigan Wtr. & Pr.	Q	1.75%	Oct.	10
West. Penn. Pr., pfd.	Q	1.75%	Nov.	1
West. El. & Mfg., com.	Q	2%	Oct.	31
West. El. & Mfg., pfd.	Q	2%	Oct.	15

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Sept. 19.	Bid Sept. 26.
Public Utilities—			
Adirondack Electric Power of Glenns Falls, common	6	9½	9½
Adirondack Electric Power of Glenns Falls, preferred	6	70	69½
American Gas & Electric of New York, common	..	102	101½
American Gas & Electric of New York, preferred	6	37½	38
American Light & Traction of New York, common	..	92	91
American Light & Traction of New York, preferred	6	79	79
American Power & Light of New York, common	4	56	56
American Power & Light of New York, preferred	6	65½	66
American Public Utilities of Grand Rapids, common	..	11	12
American Public Utilities of Grand Rapids, preferred	..	17	17
American Telephone & Telegraph of New York	9	109	107
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	7½	8
American Water Works & Elec. of New York, 1st preferred	..	46½	46
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	29	30
Cities Service of New York, common	+extra	118	117
Cities Service of New York, preferred	6	43½	43½
Commonwealth Edison of Chicago	8	108	108½
Comm. Power, Railway & Light of Jackson, common	..	10	8
Comm. Power, Railway & Light of Jackson, preferred	6	28	26½
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	43½	43
Northern States Power of Chicago, common	..	44	44
Northern States Power of Chicago, preferred	ex.div.7	79	80
Pacific Gas & Electric of San Francisco, common	..	56	56
Public Service of Northern Illinois, Chicago, common	7	79	79
Public Service of Northern Illinois, Chicago, preferred	6	80	79
Standard Gas & Electric of Chicago, common	..	7½	7½
Standard Gas & Electric of Chicago, preferred	8	33	33
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	4	3½
Western Power of San Francisco, common	..	26½	26
Western Union Telegraph of New York	..	83	82½
Industrials—			
General Electric of Schenectady	8	125	124½
Westinghouse Electric & Mfg. of Pittsburgh, common	7	44	45¼